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In this issue:

The Air Exercises - - 752
Day Among the Models 756
Meteoric Progress - - 763
North Pacific Navigation 765
Rotor Testing - - 771
"National" Nominations 772

Healthy Exercise

STEADILY and patiently the progress toward unification of operational mode and policy among the nations of the Western Powers goes ahead. Substance is given to the intent by a variety of events, not the least important example of which is the present Air Exercise. Superfortresses and F.80s of the U.S.A.F and Meteors of the Dutch Air Force are operating alongside units of our own; Belgian and Dutch personnel are helping to man flying-control and reporting staffs, and officers from all the partnership countries are acting as observers.

Although this particular exercise is designed to give practice to, and show up the operational standard of, the several components which go to make up the air defences of Great Britain, the lessons learned can have only a beneficial effect on the defensive and offensive forces of our partners in political solidarity. No matter how much is planned and postulated theoretically, it is only by means of factual experiment that the smoothness and effectiveness of the system can be determined.

The air-defence system of these Isles is a most complex organism. Attacking forces must be found, tracked and their threat assessed if the defensive action in terms of fighters or guns, or both, is to be most effectively deployed. Once put into action the defensive measures need direction and control. It is on the efficiency of the warning and filter systems and on the ability of the controllers that the quality of punishing defensive action primarily depends.

Quite what proportion of the defensive system is made up by auxiliary and territorial units cannot be disclosed, but last week-end, in addition to R.Aux.A.F. squadrons, nearly 8,000 members of the Royal Observer Corps and all available Territorial Regiments of Anti-Aircraft Command took part in the exercise, and the same strength will be applied during the coming week-end.

Competition is a salutary thing, and pitting one's wits against those of the other fellow is a sharpening process. An exercise of this kind is therefore not only tactically and strategically useful but, in addition, contributes to the healthiness of all the participating elements.

It is intended that each year there shall be two main Air Exercises, respectively with a fighter and a bomber bias, and this we deem to be a good rule. It might well be to wider advantage, however, if some future exercise could be organized on an even more multilateral basis; for example, Bomber Command could profitably deploy their skill against the air defences of, say, Belgium and Holland.

Valuable Hobby

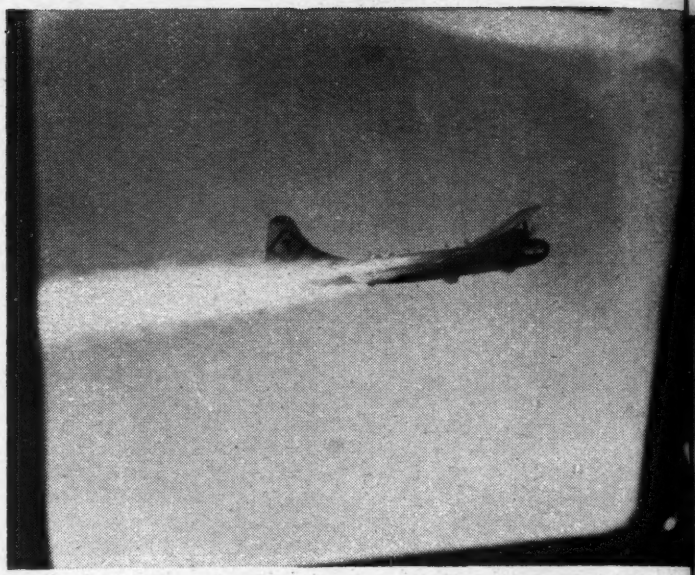
SPORTS and hobbies, in general, are admirable things from every point of view; even if we regard the question in its least charitable light, it can truthfully be said that many high-spirited young people faithfully follow the paths of rectitude because their utter absorption in leisure-hour pursuits leaves them neither the time nor the inclination to entertain themselves with more questionable forms of amusement—or, what is perhaps worse, with no sort of amusement at all.

Some hobbies, such as collecting matchbox labels, are of limited use either to the individual or the community; others are of very real value, and in the forefront of this class we would place the building and flying of model aircraft. The thought is prompted by a visit to the Northern Heights Model Gala Day, some notes on which appear in this issue. At this event, which annually attracts thousands of aeromodellers from all parts of the country, there were to be seen models which show not only the finest degree of manual skill in construction, but also a very real understanding of aerodynamic principles. As Marshal of the Royal Air Force Lord Tedder said after inspecting some of the miniature aircraft on this occasion, we have among these enthusiasts a most reassuring reserve of air-mindedness and the clearest evidence of high technical ability.

EXERCISE "FOIL"

Combined Forces Test of the Air Defences of Great Britain: Western Union Participation

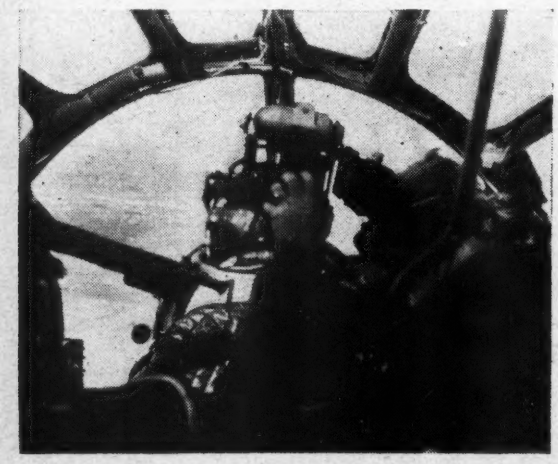
Illustrated by "Flight" Photographs



At 35,000ft, 300yd-contrails foamed in the wake of the bombers. Although the cabin glazing of the photographic B-29 showed signs of frost, its interior was warm and comfortable.

AT noon on Saturday, June 25th, there began a co-operative air exercise which, divided into three phases, is scheduled to end at dusk next Sunday, July 3rd. With over 500 aircraft taking part, it is certainly the largest operation of its kind to have been organized in this country since the war—and probably ever. Again, the fact that B-29s of the Third Air Division and F-80s of the 36th Fighter Group, U.S.A.F., are taking part, together with Meteors of the Royal Netherlands Air Force, lends a touch of realism to the concept of Western Union defence.

In that *Foil*—for that is its code-name—is an exercise primarily with a fighter bias, it is being directed by Air Marshal Sir Basil Embry, A.O.C. in C., Fighter Command, with A.V-M. E.J. Kingston-McCloughry, S.A.S.O., heading the directing staff; this from the underground operations-room at 11 Group H.Q., Uxbridge. The attacking bomber forces are being controlled by Air Marshal Sir Aubrey Ellwood, A.O.C. in C., Bomber Command, and Major-General Leon Johnson, Commanding General, Third Air Division, U.S.A.F. Air Marshal Ellwood has the whole of Bomber Command to draw on for his attacks, including Mosquitoes of the Marker Force; Lancasters, Mosquitoes, Wellingtons and Ansons of Flying Training Command; four Hornet squadrons seconded from Fighter Command; two Mosquito squadrons from B.A.F.O., Germany; aircraft from the Central Photographic Establishment, and other specialist types for such duty as dropping *Window* (the code-name employed during the war for the metal-foil strips dropped to confuse radar detection).



One of the returning B-29 formations was attacked as its home runways came into view. The "lead ship's" bombardier is putting in some fast work with his camera, in simulated control of the four-gun front upper turret.

One of the interesting features of the exercise is that Fighter Command ops. room is not being used. The Air Officers Commanding, 11 and 12 Groups—Air Vice-Marshals S. F. Vincent and G. Harcourt-Smith—are fighting their own battles independently, and arrange between themselves the necessary tactical reinforcement and handing-over of aircraft.

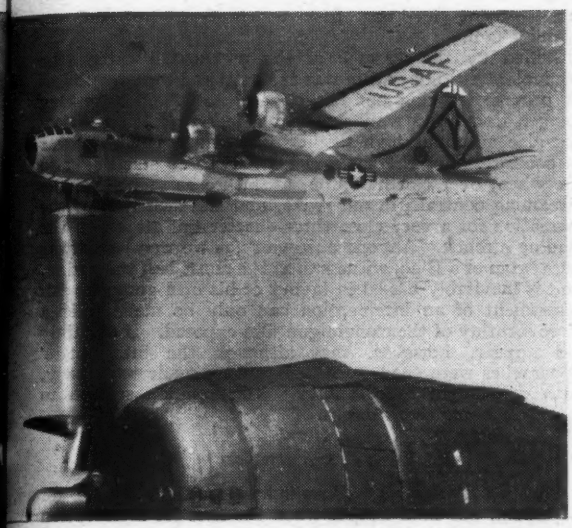
The exercise area is bounded to the north by a line between Mablethorpe, Lincs, and Southport, Lancs, and to the south by a line from Dover to Llandow, Glam. A line running roughly N.-S. between Sheffield and Farnham, Surrey, divides the area into an eastern section, where the air activity is mostly concentrated, and a western section, where the warning elements of the system are active, but over which none of the exercise as such is designed to take place. The eastern box is divided by a line running from Fenny Stratford to Halstead, and thence up to Great Yarmouth, the northerly sub-box being 12 Group area, and the southerly sub-box 11 Group area.

Form and Reality

As to the form of the action, it is divided into three phases, the first (noon, June 25th to dawn, 27th) in which Regular squadrons and units were supplemented by Auxiliary and Territorial elements; the second (dawn, 28th, to dusk, 30th), in which the Regulars have been supplemented by such Auxiliaries and Territorials as are at Summer Camp; and the third (dawn, July 2nd, to dusk, July 3rd), during which the same complement will be mustered as for Phase I. The present account deals with the development of Phase I; the remaining phases will be described next week.

Before going on to describe the sequence of events as seen from 11 Group H.Q., it should be pointed out that *Foil* is officially regarded as *not* being a war game. That is to say, there will be no assessment of "victory." Rather is there co-operation between the opposing sides. Bomber Command will do their best to give the defending organization exercise in those areas and methods in which they are most required; nevertheless, some measure of competition is inevitable in any game where sides are involved, and a very good thing, too.

Something should also be said about the lack of wartime verisimilitude. In war, actions will be furthered in the teeth of poor weather conditions; fighters will dive



On Sunday, 98 Bomb Group's aircraft operated at 25,000ft; 345 Squadron provided the leading element of three B-29s, one of which is seen en route for the English coast.

through bomber formations to break them up. In peacetime, such dangers cannot be justified, but this does not mean that they would not readily be met if such were ever again, unhappily, necessary. So much for background.

By 1200 hr on Saturday, when Phase I of the exercise opened, all the Regular squadrons were in position, and during the afternoon the Auxiliary squadrons moved to their special exercise stations. Those Auxiliary squadrons normally based outside the exercise area were put in alongside the Regular squadrons to benefit from their experience.

Radar stations were the first target of attack by Hornets and Ansons, followed almost immediately by Mosquito attacks on some of the fighter airfields. It was not, however until a little before 1600 hr that a major raid developed. Plotted approaching the East Anglian coast at 32,000ft, the force of B.29s made their penetration at Harwich, then, flying *via* Northampton, went on to bomb Birmingham and Liverpool. No. 604 (Middlesex) and 610 (Chester) Squadrons made attacks on the Superforts, and successful interceptions were reported. The operational speed range at altitudes of this order makes fighter manœuvrability a tricky business, and useful lessons should be learnt from the camera-gun records, both of the attackers and the attacked; this is, of course, the first time that British fighters have had an opportunity to pit themselves against Superfortresses, and the experience should be of great value to all concerned.

S/L. R.A.L. Morant (nearest camera, right) with some of his pilots, ground crews and aircraft waiting at the end of the Thorney Island runway for the signal to scramble.

About 1700 hr, 610 (London) Spitfires and Regular Vampires and Meteors intercepted a force of Wellingtons over the Thames Estuary. Arriving home from this sortie, the Meteors surprised a pair of Hornets attacking their base and did little more "interception."

Between 1900 and 1930 hr, another Wellington raid was intercepted at 14,000ft south of the Wash, this action being followed by attempted intruder raids by Mosquitoes on airfields in "Southern England." These, however, were adequately checked by Meteors and Vampires.

Other than a Meteor interception of five Wellingtons, east of Northampton round about 2100 hr, nothing much happened until 2330, when five distinct raiding formations at 23,000ft were plotted over the North Sea, after which they joined up into a single force of 50 plus. Mosquitoes on patrol were immediately reinforced by other night fighters. Crossing the coast between Lowestoft and Aldeburgh, the attackers turned south-west and headed for London. Marker Force Mosquitoes had their target indicators lighted at Nine Elms Goods Yard, London, spot on schedule, after which the whole raiding force turned north out of the area.

A second major force of Lancasters and Wellingtons crossed over Skegness to attack Sheffield and Coventry, and were intercepted by N.F. Mosquitoes. In addition, B.A.F.O. Mosquitoes attacked airfields in East Anglia, and simulated mining was carried out in the Humber. This completed the first night's activities.

On Sunday morning, nine Mosquitoes made a low-level attack at 0900 hr on a Kentish airfield, and a couple of hours later No. 54 Squadron Vampires intercepted a small force of B-29s at 5,000ft north-east of the Thames Estuary. In the 12 Group area, a raid developed soon after 1100 hr, when a 15 plus force was reported at 16,000ft off Cromer. The F-80s from Horsham St. Faith were ordered off to intercept, and, as the threat developed, Meteor 4s were scrambled in support. Running engagements were continued as the bombers came inland in a wide arc over Leicester and Nottingham towards Birmingham, during which they had split up into smaller groups. The F-80 pilots were full of praise for the G.C.I. directions.

The main afternoon activity started at 1300 hr and continued until about 1630, with several small groups of B-29s approaching over the Felixstowe area at 25,000ft. These were continuously intercepted by fighters, who reported considerable success. Whilst these high-altitude raids were in progress, many low-level attacks were also made by Hornets seconded from Fighter Command, but these, too, were continually intercepted. After a short lull, the low-level attacks were continued along the coast from the Thames to Lowestoft, most of the concentration being centred around the Felixstowe area. There was, however, slight penetration.

At 1900 hr, three B-29s over Oxford at 13,000ft were successfully attacked by Vampires, and, 53 minutes later, a couple of Hornets attacking an airfield in East Anglia were intercepted and beaten off 10 miles west of Ipswich. All in all, the F-80s had a busy and profitable day in which they made well over 30 sorties with nearly all pilots claiming interceptions. The Dutch Meteors were almost equally busy.

A hostile force of Lincolns with Marker Force Mosquitoes was detected at 2250 near the Dutch coast. These joined into a mass force which crossed near Felixstowe at 2355, then making for the Thames Estuary. This was a feint raid on London, for the force swung away to the north-west and, crossing Birmingham at 0025, attacked

"Exercise Foil". . . . .

Merseyside and Liverpool, simulated T.I.s being lighted at Port Sunlight.

The actual raid on London was made by Lancasters and Wellingtons, which appeared over the North Sea shortly before midnight and, via the Thames Estuary, flew over the Metropolis at 0030. This was not so strong a force as attacked on the previous night. Having raided London, the force moved west-north-west, but, when in the South Midlands, turned and headed for the Bristol Channel area. Both hostile forces were actively engaged by N.F. Mosquitoes before crossing the coast and throughout their incursion over the area, and a great many combats were reported.

With the close of Phase I, it is considered that many lessons have been learnt from which immediate profit can be gained in the next two phases, quite apart from the long-term value of the exercise as a whole. The defences must inevitably have benefited from their experience, and, particularly for the Auxiliaries and Territorials, Phase III next week-end should prove somewhat less formidable.

An eye-witness account follows by a member of the Flight staff who flew in a B-29. C. B. B-W.

WITH THE "TWENTY-NINES"

CORRESPONDENTS at Sculthorpe, from which three squadrons of B-29s operated, had an eventful week-end. On the first of two notable missions from this recently re-opened Norfolk base, two Pressmen parachuted from 20,000ft, while a third—a later arrival, who had expressed regret at missing Saturday's happenings—was involved in a forced landing on Netherlands soil a few hours later. *Flight's* representative underwent no more disturbing experience than a three-engined approach and landing, and was thus able to record fully his impressions of the capabilities of a force of U.S.A.F. medium bombers—as the B-29s are now classed.

Foil's official opening was at noon on Saturday, at which time three "Superforts" were already in the air—at 25,000ft over cloud-covered Heligoland. This apparently premature flight was not, however, inspired by any "unsporting" motive. During its 90-day stay in this country, No. 98 Group, which has been at Sculthorpe since May 18th, is, like all visiting B-29 formations, charged with the duty of completing as many training sorties as weather permits. As the operational curtain rose, therefore, we found ourselves installed in the forward pressurized compartment of *The 49er*, then preparing to deposit on Heligoland, through the overcast, a practice packet of six 500 lb bombs. It was intended to release these missiles singly, but after three had dropped in this manner, rendezvous time approached, and the remaining three bombs were unloosed together. Maintaining our altitude, we met the two other machines over Borkum and, taking up defensive vic formation, set course for England.

In view of the exceptional interest of this mission, the Commanding Officer of the Group, Col. W. Dick, and the officers commanding the three squadrons of the Group, which are based together, all took part. To their knowledge, no previous large-scale tests of British defences had included interception by jet fighters at the altitude selected for this raid. In the "lead ship" of the formation, as it began the ascent to 35,000ft, were the Group Commander and Major Birdsong, the leader of 344 Squadron; in position two, slightly below and to starboard, was our aircraft, commanded by Major Arnold of the 345th; No. 3 belonged to 333 Squadron and was flown by the C.O., Lt. Col. Gray.

Turning quietly at 2,400 r.p.m. the turbo-supercharged Wright R-3350-57s had lifted us to an indicated height of 34,200ft as we crossed the coast at Harwich. The solid blanket of stratus cloud spread across the North Sea gave place to patchier mixed formations, with occasional gaps through which one saw the blue-grey haze that was Eastern England. Leaving Harwich behind at the rate of 290 m.p.h. true air-speed, we flew on to Northampton, the turning-point for our first camera-bombing run, on Birmingham.

Lulled by the warmth of the pressurized cabin (the equivalent altitude within was 14,600ft) and the smoothness of passage, stirring but occasionally to inhale refreshing oxygen from our "walk-around bottle," we felt extremely complacent about high-altitude bombing. This was war in comfort. For the three B-29s *Foil* came startlingly to life when, over Northampton, a Spitfire 22 crept into the streaming contrails in our wake, and slid swiftly into the formation for a very close three-quarter tail attack on the leading aircraft. Anyone observing (as we were) from the nose cabin of a B-29, witnesses, at the most, half the action, and is inevitably biased in favour of his own gunners; fair assessment of an interception can only be made after a close scrutiny of the camera-gun film exposed. It certainly did appear, however, that although the intercepters' approaches were good, breakaways were made too slowly, with consequent vulnerability. This opinion seemed to apply to successive attacks.

Jet Interception

We had "bombed" Birmingham and set course for Liverpool, our final target, when the first jet interception took place. Two Meteors each made two or three passes, but would apparently have inflicted little damage on us, for altitude imposed a wide turning radius on them, and their speed on three-quarter tail approaches did not confer a safe margin above our own 290 m.p.h. Over Liverpool, as we turned away from the target, a solitary Vampire was sighted, but no attack developed. The return to Sculthorpe was, we thought, uneventful. A few minutes after landing, however, it transpired that No. 3, which had touched down as we were taxying, had lost three of its crew and two passengers. From its pilot, Col. Gray, we learned that, on the let-down from 35,000ft, while the B-29 was still in formation, its port inner engine had overspeeded to 4,500 r.p.m. Attempts at decreasing this speed and at feathering the engine had been unsuccessful, and, as there was danger of the airscrew breaking away, the cabin was depressurized, the order "stand by" given, and the nose-wheel dropped. (Besides providing an escape exit, this increases the rate of descent). Vibration from the "rogue" engine, and the noise through the nosewheel bay, made a deafening and confusing combination inside the cabin. In addition, vaporization on the windscreen had enforced instrument flying. Thus pre-occupied, the pilots discovered that the bombardier, radio operator, and navigator, with Charles Gardner of the B.B.C. and Waldo Drake of the *Los Angeles Times*, had, obviously through

G/C. H. Eeles, C.B.E., station commander at Thorney Island and officer commanding the Southern Sector, talking to the pilots of the visiting Dutch squadron.

Yorkshiremen in Hampshire: some of No. 608 Squadron's pilots. Front row, F/O. J. Henderson, Plt. Il E. Robinson, F/L. Ben Kilvington, P/O. W. J. Morris and Plt. Il A. L. Clough. On wing, F/O. J. D. Turnbull, F/O. Hector Watts and F/O. T. A. Willis.

a misunderstanding, stepped out at 20,000ft. They landed north of the Humber, fortunately with but a few minor injuries between them. Ten minutes after Sculthorpe had been notified of Mr. Gardner's safety, we heard his own story, sent from a telephone call-box and relayed by the B.B.C. on *Radio Newsreel*.

On Sunday, Sculthorpe sent a dozen aircraft into the battle. They took off in four separate operational elements (each of three aircraft), *Able, Baker, Charlie* and *Dog*. The first three elements were composed according to squadron, the three B-29s of *Able*, from the 345th, left at 0930 "Zebra" (Greenwich Mean) Time; *Baker*, from 343, at 1000 hr, *Charlie* at 1045 and *Dog*—a composite unit with one machine from each of the squadrons—at 1100.

On this "Mission 2" we flew again with the 345th, this time in the formation leader's aircraft. The first part of the operation repeated the previous day's procedure—climb to 25,000ft, independent radar bombing of Heligoland, and rendezvous over Borkum, where, as No. 1, our aircraft dropped its nosewheel in signal to our two companions to "formate." Interceptions, we thought, as the element held its altitude of 25,000ft on the North Sea crossing, would be prompter, and more difficult to deal with, as the height favoured the defence. Nevertheless, we had reached Felixstowe, flown along the coast to Southend, and moved 20 miles up the Thames estuary—in conditions so clear that the Channel, and almost all the French northern coastline, were visible—before the fighters struck. Vampires and Meteors—in disappointingly small numbers—made persistent passes, some in pairs, on each aircraft.

"Seven o'clock, level" seemed to be the popular approach, and breakaways were mainly below the formation. We retain one vivid impression of a Meteor 4, about 150ft away, slightly below us at three o'clock, with its 180-gallon belly-tank square in the centre of a perfect plan view for over a second, while gunners gloated. There was but a single head-on attack, about which few of the bomber crews had any definite recollection.

Leaving London, we headed north for a radar attack on Burtonwood, the U.S.A.F.'s major Air Lift maintenance base. The formation made a progressive let-down from the Liverpool area to Sculthorpe, which was already in view when the most furious fighter onslaught began. Some half-dozen Meteors and Vampires were involved, and were obviously enjoying the extra agility available at about 2,000ft.

Vibration from our starboard outer engine had been apparent for some time, and it was cut back to idling speed as we began to approach the runway. Gauge readings were fairly normal, but, on inspection after landing, one cylinder was found to have lost a valve, and the nacelle was streaked with oil. Power trouble of a more serious kind (for the second successive flight) affected Col. Gray's aircraft, which was leading the second element. As on the previous mission, an overspeeding unit refused to feather, and this B-29 landed at Amsterdam.

Despite the unusually high incidence of "snags," we felt that the B-29s succeeded in setting the defences an extremely severe test. Although no major modifications have been introduced in the design of the Superfortress, since it first went into action over five years ago, the U.S.A.F.'s B-29 groups undoubtedly constitute a powerful weapon, held in the hands of skilled and enthusiastic personnel. Their contribution to *Foil* promises to be of very great value. R. J. B.

FOIL AT THORNEY

THE first phase of the Exercises as seen from Thorney Island proved dull. Since nearly all the high-altitude raiding was made on London and cities north of the capital, the fighter squadrons in the Southern Sector (under the command of G/C. H. Eeles, C.B.E.) had but little joy. Proceedings were enlivened on two occasions by low-level raids, both of which got away without interception. The first of these low attacks was made by six Mosquitos from B.A.F.O. They were observed when three miles from the airfield but no protecting aircraft were at stand-by and it was impossible to make an interception. A 'phone message to Odiham, warning them of low raiders, had the desired effect and four attacks were made on six aircraft attacking that airfield. The only other excitement was provided by a Meteor which got its wheels up too soon during take-off and, scraping the runway, lost the contents of its belly fuel-tank.

For the Exercise, there were at Thorney Island two regular Meteor squadrons, the visiting Dutch squadron, also with Meteors, and No. 608 (North Riding) Squadron, R.Aux.A.F., with Spitfire 22s.

There was keen competition between the British and Netherlands units to get airborne in the shortest possible time. Average for the jet fighters was about four minutes from order to scramble to "wheels up." The best was three minutes and the worst seven minutes.

The first scramble was made by the Dutch squadron at 1730 hr on Saturday, but, because of R/T failure, no interception was made. In a further seven scrambles made during the following 24 hours the R/T was also responsible for failure to make interceptions; in all these cases, however, the trouble was caused by jamming by "enemy" forces. The Southern Sector is hoping for a larger share in the later phases of the exercise.

No. 323 Squadron, Royal Netherlands Air Force, the visiting Dutch squadron, flew direct from Leeuwarden in northern Holland, the journey taking about one hour. The ground crews came via Portsmouth in a Dutch naval vessel.

Many of the pilots feel quite at home in England, for they have all been trained with the R.A.F. and three of them, including the commanding officer, Major Flinterman, were operational during the war. All are loud in their praises of the Meteor 4.

No. 608 (North Riding) R.Aux.A.F. Squadron is at Thorney Island for summer camp. They arrived in three Handley Page Hastings on Saturday morning to take the place of No. 600 (City of London) Squadron, which returned to Biggin Hill. No. 608 was almost immediately operational, but after devoting Saturday and Sunday to *Foil* it was stood down until next week-end in order that normal training can proceed. The squadron's Spitfires appear very smart and clean but it is curious how even the Spitfire 22 begins to look and sound old-fashioned when on a jet-fighter station.

The North Riding squadron—coming, as they declare, from the place where men are still men—are very proud of the fact that they now have a waiting list for both pilots and ground crews. I. Y.

DAY AMONG THE MODELS

At the Northern Heights Gala Meeting : Chief of the Air Staff Sees Some Fine Craftsmanship

Illustrated with "Flight" Photographs

Lord Tedder shows keen interest in a pulse-jet model. With him are Lady Tedder, Mr. C. A. Rippon (vice-chairman of the Society of Model Aeronautical Engineers), and (right) Dr. A. P. Thurston, who is the "moving spirit" at this event.

UNLESS he has kept fairly closely in touch with the developments of recent years, the average "full-scale" aviation enthusiast is still apt to dismiss model aircraft as the stick-and-elastic toys he remembers from his boyhood. In actual fact, a model today is as likely as not to be an almost perfect miniature replica of some well-known type, to be powered by an internal-combustion engine, and to have an anything but toy-like performance in the air.

This was the first impression that struck a visitor to last Sunday's Gala Day of the Northern Heights Model Flying Club, an annual event which shares with the international Wakefield Cup contest the honour of being a classic in the aero-modellists' year, attracting enthusiasts from all parts of the country. It gains enormously, too, from having the support of Hawker Aircraft, Ltd., who generously throw open the vast spaces of their Langley works airfield to the competitors and their friends, provide a flying display with full-scale aircraft, and entertain the officials to lunch. Last year, it will be remembered, Her Majesty the Queen honoured the event with her presence and presented the principal award, the cup which bears her name. This year Lady Tedder presented the cup, and her distinguished husband, sparing a few hours from a busy Air Exercises week-end, came as a visitor and took the keenest interest in the affair. A crowd estimated at 10,000 attended.

In the notes which follow, it is not our object to give a detailed record of events and results, but rather to pick out for comment some of the many technical aspects which might have appealed to any "full-scale" enthusiast previously unfamiliar with model-flying progress.

Nowadays, the two-stroke, single-cylinder, internal-combustion engine is almost as common as rubber as a source of power. Compression-ignition engines outnumber battery-ignition types by about ten to one, what are known as "glow-plug" engines (in which ignition is maintained by an electrode initially heated by electricity) being popular in the highest-speed categories. Compression ratios may be as high as 20:1 and speed may reach 13,000 r.p.m. Cylinder capacities, as a rule, are between 1 c.c. and 3.5 c.c.

Lady Tedder presents the Queen's Cup to R. H. Warring.

The superb workmanship put into many of the models was most apparent in the *concours d'élégance*. Here the winning machine in the flying-scale model category was H. J. Towner's Seagull amphibian, as yet unpainted, so that the perfection of the structural work was fully apparent. It is built to a scale of 1in to 1ft, weighs 4 lb and, powered by a 2.8 c.c. diesel, flies at approximately 20 m.p.h., which is about scale speed. The undercarriage is not automatically retractable—that would be too much to expect—but when it is up, and the well-doors sealed with waterproofed tape, the aircraft is perfectly lakeworthy.

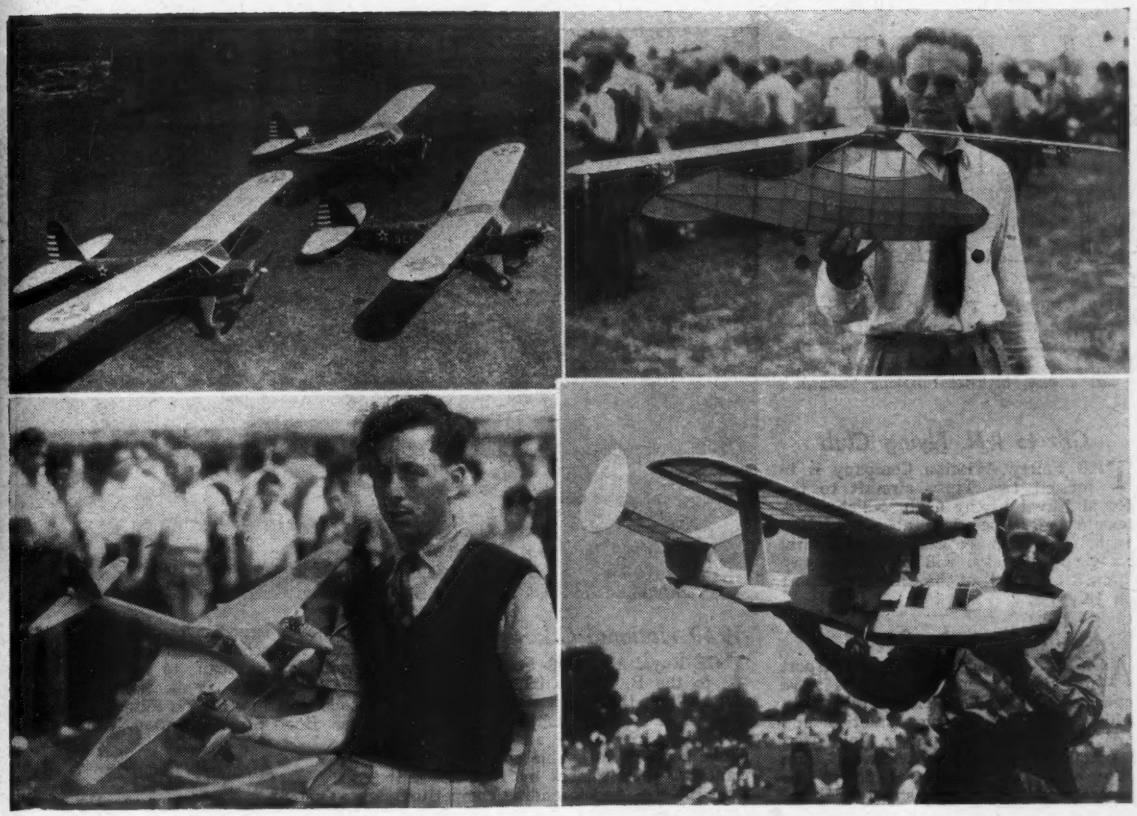
A Diesel "Twin"

Another machine, perfect in scale and workmanship, was P. Donavour-Hickie's de Havilland Hornet, which, with two 1.3 c.c. diesels, is one of Britain's first twin-engined flying scale-models; of the control-line type, it is of 28.5in wing-span, and is complete even down to cockpit fittings.

Control-line flying, incidentally, is now immensely popular, though in our purely personal view the spectacle of a small model flying in a tight circle at about three times scale speed, and sounding like an infuriated wasp, seems to lack the true spirit of flying; it does have the advantage, however, of giving the "pilot" a full measure of control, so that quite advanced aerobatics are possible.

Free flight by a well-built scale model is a joy to watch; there was, for instance, the pair of Tiger Moths (48in span, 28 oz weight) flown by P. G. Grant and S. Bowers. Each flew at about 40ft altitude in a gentle turn until the engine cut, then, relieved of the torque effect of the airscrew, went into a straight, gentle glide terminating in a perfect three-point landing.

The sailplanes, some as large as 10ft in span, are equally fascinating to watch. Launching is by line, which drops off a hook on the aircraft on nearing the vertical. The rudder, or a trimming-tab on the fin, is elastic-loaded to keep the glider in a turn, the load being initially relieved by the pull of the launching-line on its hook, so that a straight launch is possible. In some cases, to prevent loss of models by unpremeditated cross-country flights, a small tail parachute is released at a pre-set interval decided by the burning of a saltpetre fuse, and acts as a spoiler. At Langley, in blazing sunshine, there were powerful thermals over the tarmac and hangars, and several gliders, unparachuted, circled away out of sight, to be the subject of telephone messages from the surrounding country-



(Top left) Piper Patrols built by A. P. Jacobs—5ft span, 27 oz 2 c.c. diesel. (Top right) Mr. Webb's jet-rotor helicopter. (Bottom left) P. Donavour-Hickie's D. H. Hornet. (Bottom right) H. J. Towner's Seagull: it awaits its first coat of dope.

side hours later. Many power models, too, departed on cross-country flights, but the local standard of honesty seems high, for news of distant landings was coming in constantly and broadcast for the reassurance of anxious owners. The sailplane which won the *Flight* Cup was airborne for 39 min 42 sec.

The more orthodox rubber-driven machines were necessarily less spectacular to watch than were the internal-combustion models, but the standard of performance was high, particularly in the Queen's Cup competition, the rules of which are designed to develop the larger type of rubber-driven machine, with good aerodynamic design and a structure strong enough to resist the considerable tension of the rubber, and landing shocks also. The ultimate winner of the Cup, R. H. Warring, achieved a three-flight aggregate duration of 10 min 31.5 sec.

During the course of the day, periodical loud hissing noises marked the passage of models driven by the increasingly popular Jetex units, which are small rocket-motors fuelled with a slow-burning solid charge developed by I.C.I. Two such units, incidentally, provided rotor-tip propulsion for an admirable helicopter built by a Mr. Webb—which, if nothing else, proves how well aeromodellers keep abreast of the latest full-scale developments. One other jet aircraft, by the way, was a most formidable looking control-line racer powered with a true pulse-jet liquid-fuel unit.

Apart from the presence of the C.A.S., the occasion was well supported by the Royal Air Force, a party of fifty Halton apprentices under S/L. B. Crane, A.F.M., assisting in marshalling, message and other duties, while the prizes other than the Queen's Cup were presented by Mrs. North-Carter, wife of A. Cdre. North-Carter, C.B., Halton's Commanding Officer.

Short and snappy—which, as *Flight* said recently in a leading article, is what flying demonstrations should be—the show put on by Hawker pilots provided a spectacular finish to the main programme. Neville Duke in his own Tomtit, and Doc Morrell in a Tiger Moth, fought a mock battle in the 1914-18 tradition, a distinctly "dicey" affair of stalled turns and phenomenal avoidances; Wimpey Wade did some spectacular beat-ups in a Sea Fury, leaving in his wake a terrific eddy which came roaring and rustling earthward, like a miniature tornado, when the aircraft was a mile distant; and Arthur Harrison made a nicely judged parachute descent from the Tiger.

PRINCIPAL RESULTS

The Queen's Cup.—(1) R. H. Warring, 631.5 sec aggregate; (2) R. Jessop, 475.4; (3) E. T. Watts, 475.2.

"Flight" Cup (gliders).—W. J. Balaam, 39 min 42.2 sec.

Fairey Cup (duration, rubber-driven models).—E. D. Gordon, 17 min 20.2 sec.

Coronation Cup (power-driven models).—C. W. Allen.

Concours d'Elégance

POWER.—K. Chambers.
GENERAL, FLYING.—J. K. Brady (sailplane).
FLYING SCALE MODELS.—H. J. Towner (Seagull).
DITTO, CONTROL-LINE.—P. Donovour-Hickie (Hornet).
SOLID SCALE MODELS.—N. Young (Messerschmitt 210).
HELICOPTERS.—Mr. Webb.

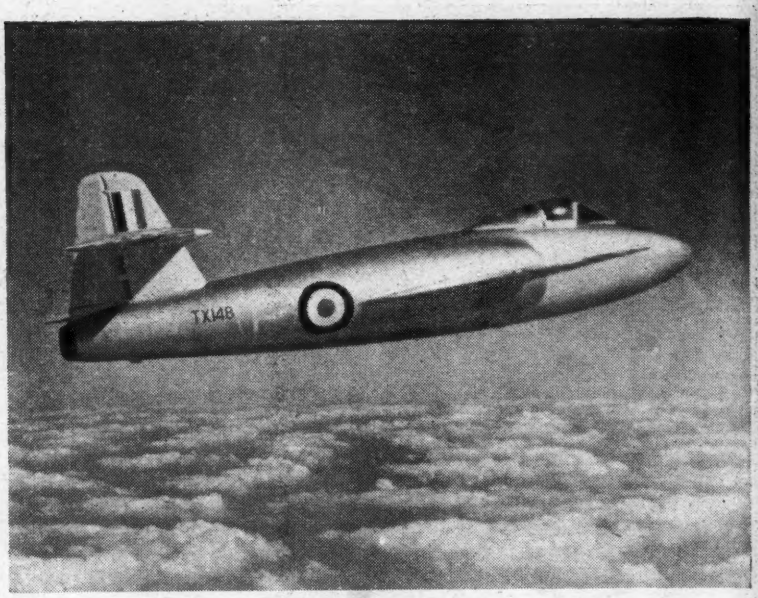
THE INDUSTRY HONOURS C. M. POULSEN

AT a farewell luncheon given by the management committee of the Society of British Aircraft Constructors at the Café Royal, London, on June 22nd, to Mr. C. M. Poulsen, on his retirement from the editorship of *Flight*, he was officially informed that, in recognition of his services to the British aircraft industry during his connection with *Flight*, it had been decided to present him with a sailing vessel and an outboard motor.

Mr. Robert Blackburn, as one of the oldest friends of Mr. Poulsen, referred to the sane and balanced way in which the products of the British aircraft industry had always been presented in the pages of *Flight*. In reply, Mr. Poulsen said that he had always attempted to be fair and impartial, and recalled that on one occasion the representatives of two rival firms had each claimed that too much publicity was given to the products of the other firm—from this he concluded that he had managed to hold the scales fairly evenly.

Those present were: C. V. Allen; R. Blackburn (Blackburn and General Aircraft); E. C. Bowyer (Director, S.B.A.C.); H. Burroughs (Gloster); Sir Arthur Gouge (Saunders-Roe); Sir Frederick Handley Page, C.B.E.; M. H. Harris; R. T. Hughes (Sec., S.B.A.C.); Sir Hew Kilner, M.C. (Vickers-Armstrongs); J. D. North (Boulton Paul); J. J. Parkes (Alvis); F. E. N. St. Barbe (de Havilland); J. Smith, C.B.E. (Supermarine); Sir Frank Spriggs, K.B.E. (Hawker Siddeley); and W. R. Verdon-Smith (Bristol).

HERE AND THERE



PHOTOGENIC : The shapely and compact appearance of the Gloster E.1/44 is well shown in this new air-to-air view at altitude. This prototype, it will be noted, has a new, high-set tailplane position.

Gift to R.N. Flying Club

THE Fairey Aviation Company is to present two Tipsy aircraft to the Royal Naval Flying Club, which is re-opening after being in abeyance since 1938. The Fifth Sea Lord, Vice-Admiral Sir George Creasy, will accept the two aircraft on behalf of the Club at Gosport on July 1st.

Seats at the Races

ADMISSION prices to Elmdon Airport for the National Air Races have now been fixed. On Friday, July 29th, which is a non-racing, practice and arrival day, and on Sunday, July 31st, a practice day and the R.Aux.A.F. race day, admission will be 2s 6d to the general enclosures; grandstand seats, including admission to airport, will be 7s 6d each and parking charges will be 5s for cars, 1s for motor cycles and 6d for bicycles. On Saturday, July 30th, and Monday, August 1st, which are the two major racing days, admission will be 5s to the general enclosures, and grandstand seats will be £1 each. Parking charges for cars, motor cycles and bicycles will be 10s, 2s 6d and 6d each respectively. Children under 14 will be admitted at half price on all days. Grandstand seats can be booked in advance for all four days at the National Air Races Advance Booking Office, Aviation Centre, Royal Aero Club, Londonderry House, London, W.1.

1949 National Gliding Contests

THE Royal Aero Club has donated £50 to the B.G.A. to be used as prize money for the 1949 Contests. The Derbyshire and Lancashire Gliding Club is hoping to receive an allocation of petrol coupons to enable competitors to transport their gliders by road to and from the site, and intending competitors are advised to apply for petrol coupons when submitting their entries. Full details of the car to be used, stating the bases from which the glider will be brought and to which it will be returned, and including the total distance to be covered, should be given.

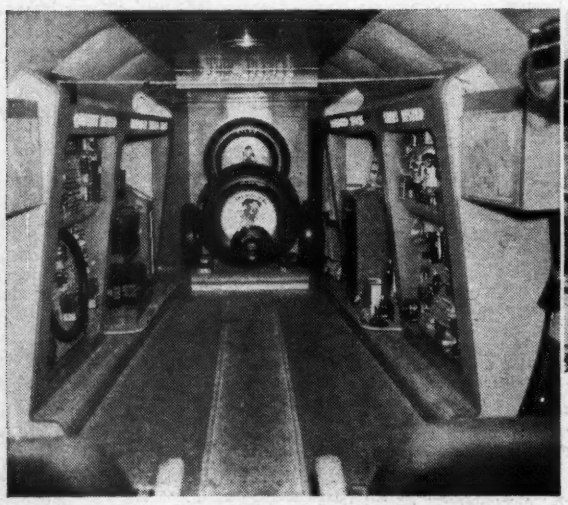
New Instructional Films

SHELL Film Unit has produced an excellent series of six instructional films entitled *How an Aeroplane Flies*, in which use is made both of animation and direct photography to explain the basic principles of aerodynamics. To supplement the commentary, a series of lectures is issued in brochure form. The films, in both 16- and 35-mm sizes, are available on loan to training units, societies, etc.; application should be made to the Petroleum Films Bureau, 29, New Bond Street, London, W.1.

Aircraft Exports

DURING the first four months of this year, British aircraft were exported to the value of over £11,152,988. Although this was, on a monthly basis, slightly below the figure required if the industry is to reach its 1949 target of £35,000,000, the Society of British Aircraft Constructors states that orders already placed, and negotiations reaching the signature stage, seem likely to cover more than 1,000 aircraft.

Among notably popular purchases of late have been the Meteor and Vampire, which have been ordered by nine countries during the first five months of the year, and valuable orders have been received for the Prentice. Interest in the Dove, now entering its fourth year



"Flight" photographs

SKY MERCHANT : On the final stages of a seven-weeks' business tour of Europe and North Africa, the DC-4 Atlas Sky Merchant, flying showroom of the Atlas Supply Co., landed at London Airport last Thursday. Ten executives, headed by Mr. F. H. Bedford, jr. (president), were aboard. Shown are the interior and a pictorial record of the DC-4's travels.

HERE AND THERE

of production, shows no signs of flagging, and there have been several recent orders for the Bristol 170.

I.O.W. Garden Party

THE Isle of Wight branch of the Air League of the British Empire is holding an aerial garden party and "at home" on July 9th. It takes place at Lea Airport, Sandown, and the programme is due to begin at 1430 hours.

Jet Licences Refused

IT is reported that during negotiations for a five-year trade agreement between Britain and Yugoslavia, which began on March 3rd, an approach was made by Yugoslavia for licences to build British turbojets to power her fighters. The British Government refused the request.

A Place in History

MANY important historical documents, previously inaccessible, are included in a recent gift to the American nation—the papers of Orville and Wilbur Wright. Presented by the executors of the late Orville Wright's estate, they are to be kept in the Library of Congress, Washington. They cover a period of many years, and include diaries and notebooks detailing the Wrights' experiments from 1903 to 1910, and a description of the first flights, at Kitty Hawk.

Banshees Battle

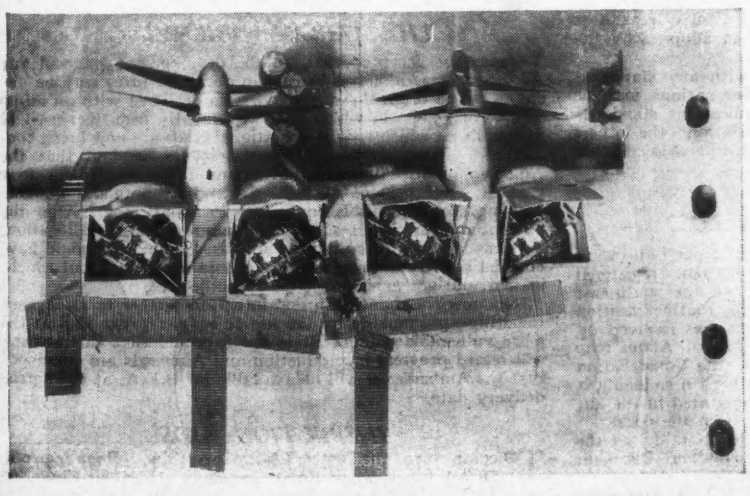
FROM performance figures recently quoted in America, it appears that the McDonnell F2H-2 Banshee, now in service with the U.S. Navy, is one of the most effective of U.S. fighters for high-altitude interception. Navy pilots are said to have reported favourably on manœuvrability at 43,000ft, where its Mach limitation of .85 restricted maximum speed to 562 m.p.h.

Two Banshees, catapulted from an aircraft carrier, recently made a successful interception of two "raiding" machines of the same type at 40,000ft, at a distance of 80 miles from the carrier, following warning by radar picket ships when the simulated attackers were 180 miles away. The Banshee carries six 20 mm cannon, and is powered by two Westinghouse J-34 axial turbojets, each rated at 3,000 lb s.t.

Magnetic Air-surveys

INVOLVING the use of an instrument known as the magnetometer, the completion of what is claimed to be the first commercial aeromagnetic survey is announced by Aeromagnetic Surveys, Ltd., a Canadian subsidiary of the Hunting Aviation Group. The instrument is based upon one used by the American Navy during the war for detection of submerged submarines. The naval apparatus was so sensitive that it could detect a variation of about one part in 65,000 in the earth's magnetic field; since geologic structural changes can cause variations of much greater magnitude, the possibilities of adapting the instrument for geophysical exploration were quickly realized. The equipment used in the Canadian surveys is installed in a Canso amphibian.

BROKEN CURVES: As an experimental patrol and search aircraft for the U.S. Navy, with the designation Po-1w, this Constellation has acquired two large radomes, above and below the fuselage, and lost its normally sleek appearance. Modifications to the nose are also apparent.



PUZZLE PICTURE: This unusual view from the 70ft-high catwalk above the floor of the new Filton assembly hall shows well the disposition of the Brabazon's "buried" power plants—coupled Centaurus units—which recently received A.R.B. type-test approval, and develop over 5,000 h.p. each.

News in Brief

IT is announced that the Rt. Hon. Sir Archibald Sinclair, who was Secretary of State for Air from 1940 to 1945, has accepted the post of honorary treasurer to the R.A.F. Benevolent Fund.

* * *

Mr. J. C. Needham, senior managing director of Evershed and Vignoles, Ltd., has retired after 48 years service with the company. He retains his seat on the board.

* * *

British aviation firms who conduct business with Italy should find good use for an Italian-English technical glossary which, covering many spheres of transport and engineering, devotes ten pages to aircraft. Edizioni Tines, Via Guiseppe de Blasis 5, Naples, are the publishers.

* * *

Dick Reidel and Bill Barris, of Fullerton, California, who in April last landed after spending six weeks in the air, are reported to have lost $4,000 (£1,000) in setting up this endurance record. Expenses of the flight, excluding those of three previous attempts, totalled $12.000.

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Details of a scheme by which scientific and technical papers may be filed, catalogued, and made available on demand in the form of microfilmed copies are issued by the American Documentation Institute, Science Service Building, 1719 N Street, Northwest, Washington D.C.

* * *

Members of the Institution of Mechanical Engineers recently visited the Samlesbury (Preston) factory of the English Electric Co., Ltd., where they saw Vampires in production and watched an aerobatic demonstration by S/L. J. Squires. The party also visited the company's Liverpool works, where Napier turboprops are made.

* * *

Considerable sums spent in equipping the Dunlop factories at Coventry with the most modern machinery have enabled them to play an important part in the expansion of the company's aviation division, said Sir Clive Baillieu (chairman) at the annual meeting. Dunlop tyres were fitted to American airliners operated by British, Dutch, Belgian and Swiss lines and also to the aircraft operated by B.O.A.C.

CIVIL AVIATION NEWS

I.L.S. and G.C.A. Approved · Inspection Aids : I.A.T.A. Clearances

"Flight" photograph

MANXLAND'S OWN: With the exception of the route to Ireland (which is reserved exclusively for B.E.A.), the Isle of Man's own airline, North-West Airlines (I.o.M.), Ltd., is now operating over a number of routes radiating from the island. Several services daily are flown to Glasgow, Newcastle, Blackpool, Leeds, Manchester and Birmingham, reaching a maximum frequency of five a day on some routes at the week-ends. Rapides will normally be used, but 32-seater Dakotas, the first of which is seen above, will fly when bookings warrant the larger capacity. An interior view appears on the opposite page.

I.C.A.O. APPROVES TWO AIDS

THE Council of I.C.A.O. has approved I.L.S. and G.C.A. for international use. The former has been specified as the aid for all regular international airports where a blind-landing system is required and G.C.A. has been approved as a supplementary device wherever it will materially assist air traffic control, or elsewhere for aircraft not fitted with I.L.S. Other provisions for standard equipment include the selection of V.H.F. Omnirange as a short-distance radio-aid to navigation when justified by traffic volume. Omnirange beacons, as they are, provide a continuous direct reading of the aircraft's bearing from a fixed ground station, but a standardized distance-measuring indicator will be incorporated when available.

A long-range navigational aid is not yet approved, as there is not a system which is considered suitable for adoption as a standard. The Council has recommended, however, that research and development should continue on this problem and that, in the meantime, present types of long-distance aids should be maintained.

Aeronautical telecommunication standards will be effective as from March 1st, 1950, unless previously disapproved by a majority of I.C.A.O. members. Authority for establishing standards comes from the Convention on International Civil Aviation concluded at Chicago in 1944 and a set of standards becomes an annexe to the Convention when adopted by the I.C.A.O. Council.

Any state which is unable to comply with any standards must notify I.C.A.O. so that other member nations may be warned of divergencies. The telecommunications standards are the tenth set adopted by the Organization; the others include rules of the air, personnel licensing, dimensional standardization, maps and charts.

K.L.M. CONSTELLATION LOST

WHEN nearing the end of an extra flight from Batavia to Amsterdam, a K.L.M. Constellation 749, registered PH-TEA, crashed on June 23rd off Bari, on the south-east coast of Italy. After taking off from Cairo, routine position reports were passed until 1025 hr, when one was received by Rome control, after which nothing more was heard. About 1030 hr (local time), according to eye-witnesses, the Constellation was flying at an estimated height of 15,000ft when suddenly it went into a steep dive and, say some, disintegrated in the air. It finally fell into the sea a short distance from the coast.

The loss is a particularly personal one for K.L.M., as the pilot was Captain J. C. Plesman, son of Dr. Albert Plesman, president of the Company.

Four accident-investigating officers from K.L.M. and eight from the Dutch Civil Air Ministry left immediately for the scene, but it is unlikely that any further information will be available until the aircraft is salvaged. There were 11 crew and 22 passengers on board, all of whom were killed.

AIR BROKERS' ASSOCIATION

MEMBERS of the Baltic Exchange have formed an Air Brokers' Association as a non-profit-making organization of some 70 members representing airlines and charter companies. Membership is at present limited to Baltic members, but it is hoped later to broaden the basis of membership. Full support has been promised by the Board of Trade and the Ministry of Civil Aviation.

The Association will seek to establish and maintain a world market for the charter of aircraft for the carriage of freight and passengers and for other commercial purposes. In co-operation with the British Air Charter Association, documents of carriage are being drawn up relative to all aspects of the work; one of these documents, the Baltairvoy, for single-voyage charter purposes, has already been published, and recently was accepted in Paris as the basis for international air-charter documentation.

Market research is being undertaken and information on traffic offering and aircraft availability will be circulated to and from the Air Brokers' Association. Similar organizations have been set up in Antwerp, Amsterdam and Paris. In addition to daily representation on the Baltic, the Association now has an office at 57, St. Mary's Axe, London, E.C.3.

THE AMBASSADOR WING

IT must be accepted that, in the development stage of any aircraft, weaknesses in certain design-features may be disclosed. The original Ambassador was designed with an all-up weight of 45,000 lb which has subsequently been increased to 52,000 lb, at which weight operational trials are now being conducted. The airworthiness requirements demand that the Ambassador structure shall withstand forces equivalent to a gust of 50 ft per sec at full load and at normal maximum cruising speed. This is equivalent to about $4\frac{1}{2}$ g. After the first ground test had resulted in a failure certain modifications were made which, according to unbiased opinions, should have enabled the structure to withstand these severe tests but which, in fact, did not achieve the desired objective.

It is now the manufacturers' intention further to strengthen the wing—presumably by the use of heavier-gauge skin at the more vulnerable points. It is not expected that this setback will retard progress in production and Airspeeds are convinced that the Ambassador will be available for B.E.A. at the agreed delivery date.

INSPECTION AIDS

TO complement the British Civil Airworthiness Requirements, the Air Registration Board announce that their *Civil Aircraft Inspection Procedures* are now available; they constitute the Board's recommendations on inspection duties for the various aspects of construction, overhaul, repair and maintenance. The information given is essentially of a general character, and no detailed guidance is included on specific types of air-

frames, engines or specialized equipment; it is felt that these are fully dealt with in the appropriate manufacturers' publications.

The *Inspection Procedures* are issued in the form of leaflets designed for incorporation in a folder, and represent excellent value for money at 4d each, particularly as one leaflet may well run to 15 or more pages. It is the intention that leaflets should be produced and issued in batches of six or twelve at a time; the first dozen, recently issued, are:—

BL/5-1	Tightening and Locking of Screw-threaded Parts.
BL/6-1	Soft Soldering.
BL/6-3	Casein Cement.
BL/6-4	Oxy-Acetylene Welding.
BL/8-1	Crack Detection.
AL/3-1	Installation and Maintenance of Flying-Control Systems.
AL/3-2	Control Chains.
AL/7-3	Doping
AL/10-1	Routine Maintenance Checks of Airframe Instruments.
EL/10-1	Prevention of Corrosion in Aircraft Engines.
EL/1-1	Batteries (Lead-Acid Type).
EL/2-1	Electrical Testing of Fire-Extinguishing Systems.

It is intended to issue new batches of leaflets at intervals of approximately three months. It should be emphasized that these procedures are nothing other than recommendations, but where, in the interests of safety, it is necessary to make a particular procedure mandatory, it will be included in the Civil Airworthiness Requirements and indicated as such in the *Inspection Procedures*: it is then for the user to co-ordinate the two publications.

Applications for leaflets and folders (the latter are priced at 9s 6d each, including postage) should be addressed to the Air Registration Board (Publications Department), Greville House, 37, Gratton Road, Cheltenham, Glos.

CLEARING-HOUSE FIGURES

INTERNATIONAL air-traffic transactions handled by the I.A.T.A. Clearing House in London during the first four months of this year totalled $46,370,000, as compared with $24,938,000 during the same period last year. Monthly totals for March and April were $11,600,000 and $11,583,000 respectively. These two amounts were settled by cash payments of $891,000 for March and $769,000 for April, which alone saved members the necessity of transferring cash and paying exchange premiums on 84.6 per cent of their March transactions and 86.7 per cent of their April transactions. Of the total transactions for the first four months of 1949, 85 per cent have been settled entirely by offset, as against 77 per cent during the same period of 1948.

BREVITIES

WITH the introduction of de Havilland Doves, Air Malta, Ltd., are considering reopening the route Malta-Tunis-Algiers-Tangier-Gibraltar, suspended through lack of suitable aircraft.

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Seven hundred million miles have now been flown by Pan American Airways, according to a recently issued statement; over this distance 9,500,000 passengers have been carried. Operations began over a 90-mile route between Key West and Havana in 1927.

* * *

The Air Registration Board has announced the appearance of *Notice to Licensed Aircraft Engineers and to Owners of Civil Aircraft No. 17, issue 5*. It refers to the issue, by approved maintenance engineers in certain areas abroad, of certificates of safety in respect of aircraft registered in the United Kingdom.

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Interest in Corsica as a tourist and holiday resort, combined with the obvious advantages of air transport to the island, are responsible for a considerable increase in the number of Air France services from the mainland. The total weekly scheduled flights were increased to 26 on June 27th, flying seven return services between Nice and Bastia, four between Nice and Ajaccio, six between Marseilles and Bastia and nine between Marseilles and Ajaccio. The company has opened two new air stations in Lyons, one exclusively for the handling of freight and parcel post and the other for passengers. The latter station is said to compare favourably with the most up-to-date in Europe.

"Flight" photograph

***PAYING LOAD:** Interior of a North-West Airlines (I.O.M.) Ltd., Dakota converted to seat 32 passengers in Rumbold bench-type seats. Conversion was by the B.O.A.C. Maintenance Branch at Croydon to the specification of W. S. Shackleton, Ltd., and provides adequate room and comfort, particularly in view of the comparatively short hauls on which the aircraft will be engaged.*

* * *

In answer to a question in the House of Commons, Mr. Lindgren said that B.S.A.A. crews would start Convair conversion training in September in readiness for route operations in January, 1950. He was not certain that a Canadair training programme had been arranged for the ground staff.

* * *

Bahamas Airways, Ltd., at present operate a Catalina service each Saturday between West Palm Beach and Nassau. During the winter season, January to March, the frequency will be increased to handle the large tourist traffic between the U.S.A. and Nassau.

* * *

The Secretary of State for the Colonies has revealed in the House of Commons that the East African Airways Corporation is exempt from a tax of 9d a gallon on aviation fuel because it is a non-profit-making public utility which is subsidized by the East African Government. The tax is charged to private users and charter companies in East Africa.

* * *

For the operation of I.C.A.O. during 1950, a budget of 2,810,607 Canadian dollars has been voted. This figure is smaller by $261,000 than the original estimates of the I.C.A.O. Council, but will allow the organization to continue its working programme at the present level without allowing for any expansion of the total budget. The 1949 budget is $649,685. The Fourth Assembly of I.C.A.O. will be held in Buenos Aires.

* * *

It is claimed by B.E.A. that in April this year the load factor on the Channel Islands route was 80.5 per cent compared with 58.8 per cent in April last year. In the same periods the load factor on the Belfast route rose from 46.3 to 82 per cent. During the period April 1 to June 4 this year, passengers carried on the Channel Islands route numbered 11,700; between London and Scotland 8,900 were carried, and between London and Belfast 6,600.

* * *

The Anglo-Iranian Oil Co., Ltd., has published, in brochure form, details of the BP Aviation Service throughout the world. In addition to lists of the grades of fuels which are available at each airport, special indication is given of customs airports and of whether prior notice is required before landing. The information, which is of considerable importance to commercial operators and private pilots, will be revised and re-issued periodically.

* * *

A bilateral agreement between Australia and Pakistan was signed in Karachi on June 5th. The agreement provides for Q.E.A. to fly over Pakistan and operate into Karachi airport and for a Pakistan airline to operate services to Sydney. Passenger and other traffic between the two countries is to be equally shared between Q.E.A. and the Pakistan airline, but

Civil Aviation News . . . . .

fifth-freedom rights are granted only when the home-based airline is unable to provide a service. Actual passenger and cargo capacity and rates to be charged will be agreed before the agreement comes into force.

* * *

American Overseas Airlines has taken delivery of the first of eight Stratocruisers which are to operate non-stop services between New York and London and New York and Shannon. It is expected that the first will be put into service on August 17th.

* * *

A week-end feature of interest to visitors at London Airport is an occasional talk on aviation through the public-address system. On June 19th to commemorate the Alcock-Brown flight, Mr. Basil Clarke spoke on Atlantic flying, a history of which he has recently written.

* * *

B.O.A.C. Yorks, now operating on the routes between the United Kingdom and West Africa, the Middle East, Pakistan and India, have been converted to accommodate 21 passengers in one large cabin; they originally seated 18 in two cabins. Several internal modifications have also been incorporated, including double-thickness windows, new soundproofing materials in the walls, a false ceiling, concealed lighting and overhead racks for hand luggage. The modifications were designed and carried out by the Corporation's No. 2 Maintenance Unit at Hurn.

* * *

Since its formation in June, 1946, and up to the end of 1948, Iranian Airways Co., of Teheran, have totalled 13,142 flying hours, carrying 42,239 passengers and 558 tons of excess baggage, cargo and mail. Mail was not carried by the airline during 1946. In addition to internal routes, the airline also operates to Athens, Baghdad, Beirut, Bombay, Cairo, Karachi, Jeddah, Lydda, Paris and Rome.

* * *

Passengers travelling on the Qantas Empire Airways' Constellation service between Australia and the United Kingdom may now send airadiograms of up to 20 words at all times except within two hours of reaching terminal airports or one hour of intermediate stops. The reintroduction of this pre-war service also applies to the Sydney-Hong Kong Skymaster service which started on June 6th.

FROM THE CLUBS

NEWCASTLE-UPON-TYNE held its annual air display at the Municipal Airport, Woolsington, on June 19th. R.A.F. Week was staged in Newcastle from June 20th to 25th and the display was arranged on the Sunday as the opening feature of an Air Week. More than 10,000 spectators were estimated to be present when Air Marshal Sir Basil Embry, K.B.E., C.B., D.S.O., D.F.C., A.F.C., having been introduced by the Lord Mayor, Councillor A. Charlton Curry, J.P., declared the Display open.

Impressive timing brought No. 607 (County of Durham) R.Aux.A.F. Squadron of Spitfires over the airfield within seconds of the Display being declared open, and then followed formation flying and aerobatics. The display did not interfere with normal scheduled civil operations of Air Transport (Charter) (C.I.), Ltd., whose DC-3 took off, between events, for Jersey. Mr. E. Harrison demonstrated an Auster fitted with the Goodyear cross-wind landing gear, and a perfectly timed parachute descent from 3,000 ft, with 1,000 ft delay, was made by Mr. C. Thompson. S/L. Evans, A.F.C., C.F.I. of Newcastle Aero Club, delighted the crowd with an aerobatic display in a Tiger Moth, and Mr. John Leach, chief engineer and test pilot of Slingsby Sailplanes, gave a revealing demonstration on the Motor Tutor, finishing off with a dead-stick landing.

Newcastle Gliding Club was represented by a Petrel and a two-seater sailplane in the hands of Mr. Arthur Burningham and Mr. O'Grady respectively, the latter looping, spinning and stall-turning as he lost height. No. 616 R.Aux.A.F. Squadron then shattered the stillness of the previous event with their Meteors in close formation. In a crazy-flying event, staged by the Newcastle Aero Club, everybody seemed to participate, including police, fire fighters, and air-traffic control. The crash siren sounded as a "spectator" dashed out of the crowd and dragged the pilot from the cockpit of a Tiger Moth, which was then seen to take off with the "spectator" head downwards in the cockpit and his legs in the air.

Four sticks of parachutists of the 17th Parachute Battalion (Durham Light Infantry) T.A., made descents from a static balloon with Mr. Raymond Glendenning broadcasting a short biography of each parachutist. The display closed with a highly polished display of aerobatics in a Spitfire and Meteor from R.A.F. Station, Acklington.

* * *

RECENT dances held by the South Coast Flying Club have proved so successful that it has been decided to hold a "Mid-Summer Dance" on Saturday, July 9th. A coach has been arranged to take members to the *Daily Express* Air Pageant at Gatwick on July 23rd.

* * *

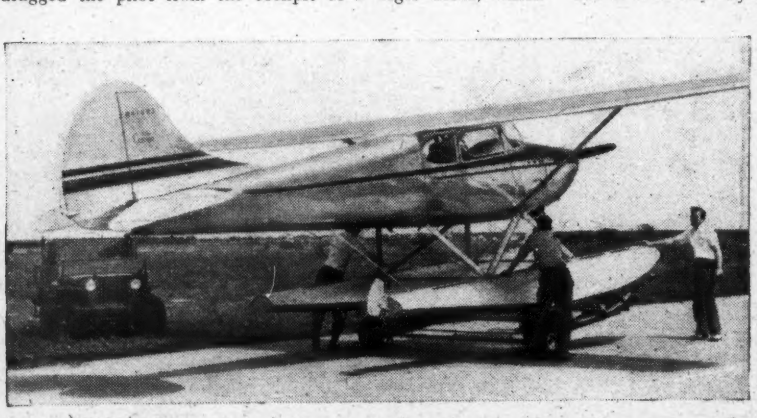
AT a meeting of the reorganized Aero Club of India, held in New Delhi recently, Mr. Biren Roy, of Bengal, was unanimously elected chairman of management for 1949-50, and Sir Ushanath Sen, vice-chairman. Members of the executive committee for the year are Mr. D. Nanavati, Mr. J. Sinclair, A.V-M. S. Mukherji, Mr. G. Subramaniam, Mr. K. Cambata, F/L. Contractor and Mr. B. Lal. Pandit Jawaharlal Nehru, Prime Minister of India, continues to be president for the year.

* * *

INSTEAD of a public flying display at Derby this year the Derby Aero Club held a garden party and "At Home" for members and their guests. This departure from the practice of preceding years proved extremely successful, as the Club was fortunate in having brilliant sunshine for the occasion, although flying conditions were turbulent. Strong thermals were ideal for Gerry Smith's exhibition of aerobatics in a sailplane and he could, undoubtedly, have amused himself over the airfield for hours. He brought his graceful exhibition to a close by landing and parking within a foot of the other aircraft on the tarmac.

Five Magisters competed for the Harben Memorial Trophy, which is confined to professional pilots on the staff of Air Schools, Ltd., and its associated companies, Derby Aviation, Ltd., and Wolverhampton Aviation, Ltd. The handicapping was extremely close, resulting in a fine finish in which S/L. Loveridge won by half a length from F/L. Findlay. S/L. Smith gave a very convincing exhibition of how an aircraft should not be flown.

The annual inter-club competition between the Derby Aero Club and the Wolverhampton Aero Club in the form of a relay race was won by the home team. The Woodward Trophy, presented for a competition between members of the Derby Aero Club in a landing contest, was won by the donor of the Trophy, Mr. C. A. Woodward. S/L. R. L. Porteous wound up the programme with a display of aerobatics in an Auster Autocrat and a demonstration of an Auster fitted with the Goodyear undercarriage.



DRY LAUNCH: The new all-metal model Cessna 170 floatplane was flown-off from Witchita Airfield on a "dolly." Tests are being conducted at Lake Afton, Witchita. This four-seater is powered by a 140 h.p. Continental six-cylinder horizontally opposed air-cooled engine.

A Meteor 7 flown, from the front seat, by Mr. Dryland, is paced by the photographic Proctor at 120 kt indicated.

METEORIC PROGRESS

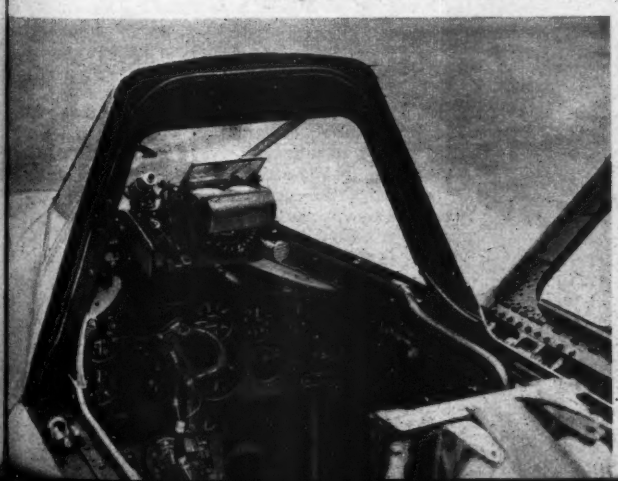
Mark 7 Trainer Achieves Mach 0·85 : A Test Pilot's Day

THE day's work is a full one for the Gloster test pilots, Meteor 4s and 7s for the R.A.F., Belgium and the Netherlands are rolling off the line apace, and for Naval Aviation there are additional Mark 7s. On the development side the new Meteor 8 fighter, two E.10/44 research aircraft and various Meteor 4 innovations demand attention. Demonstrations, delivery flights and liaison complete the daily round. Chief test pilot Bill Waterton has departed for leave in his native Canada and is making a routine visit to the Argentine *en route*. Acting for him is Rodney Dryland, supported by J. Cooksey and J. Zurakowski (both with a wealth of Meteor experience behind them), and, for a month past, by M. P. Kilburn. Since operating on most Spitfire Marks from 1 to 21, Mr. Kilburn has spent a period in Fairey's drawing office.

Rodney Dryland's day started last Thursday week when he coaxed his company's Proctor from a remarkably short stretch of the Brockworth strip, with four up (the writer included), luggage, cameras and a parachute. From this same strip new, half-painted Meteors are taken off at light weight for flight-testing from the main airfield at Morton Valence. The Proctor was bound across-country for Pershore, where Meteor 7s are being "modded" to the latest standards.

Routine business at Pershore despatched, shirt-sleeved Mr. Dryland saw that we were harnessed, oxygenated and intercommunicable in the back seat of a Meteor 7, installed himself forward and battened down the massive hood. With an unemotional brown butterfly sharing the cockpit, we whistled away and nosed up through a cloud gap at

Showing how field of view benefits from the retractable gunsight, newly installed in the Meteor 7.



L. to r., Mr. J. Cooksey, G/C. Mahmoud, Mr. R. Dryland, W/C. Sidky, Mr. Eric Greenwood, during a visit by the Egyptian officers to try the Meteor 7. The aircraft shown achieved Mach 0.85

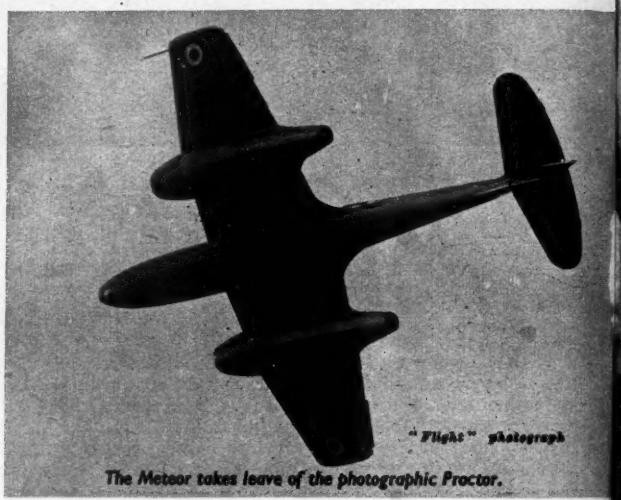
METEORIC PROGRESS . . . . .

a modest 5,000ft/min, seeking Mr. Cooksey in the photographic Proctor, which, distantly glimpsed, was intercepted in true Meteoric style. Decelerated by dive brakes, the Meteor snuggled in alongside, with 120 knots or less on the clock, and, for as long as required, 600-m.p.h. jet and 150-m.p.h. taxi flew happily wing to wing. One could appreciate the confidence of F/L. Scannell during his slow Meteor run before the multitudes at Evere.

But the Meteor is happiest with the Derwents wide open, translating their immense thrust into high Mach numbers and sensational climbs; so we were glad to peel off from the Proctor for an aerobatic session. Our butterfly was perfectly happy in rolls but with its flying zone inverted for fifteen seconds, and bombarded with dirt from the floor, was forced to take smart evasive action. Its composure was quite restored when we dived to tree-top level, upward-rolled away and nosed down again for Moreton Valence to "buzz the strip" and again retire rolling. By the time the twin-bag Dunlop brakes had squeezed us to a stop on landing, it was up-front with Rodney Dryland, who liberated it.

Immediately after lunch Dryland was airborne again on two demonstration flights, one each for G/C. Mahmoud, Egyptian Air Attaché, and W/C. Sidky, who has lately taken over command of the Egyptian Air Force's Navigation School. W/C. Sidky related for us, with evident satisfaction, how, on his trip the Meteor had achieved a Mach number of 0.85, in a dive from 13,000ft to 5,000ft. This is appreciably higher than the figure claimed, and although not obtained by all Meteor airframes, has twice been recorded by a Mk. 7 within a few days. On the first occasion Dryland was familiarizing Kilburn with compressibility characteristics and achieved the figure at 28,500ft. A strong nose-up force resulted, against which the elevator trim tab was ineffective.

The afternoon's demonstrations completed, Dryland, Cooksey and "Zura" found time to hurry across to Brussels,



"Flight" photograph

The Meteor takes leave of the photographic Proctor.

The flight shed—indicative of the tempo at which Glosters are working.

via Manston, in three Meteor 4s, hand them over to the Belgian Air Force, and return to Manston before calling it a day. Every week a batch of Meteors is ferried over. On June 2nd Dryland and Cooksey, in two Mk. 4s, had an especially fast trip: from opening up at Manston to touching down at Melsbroeck their time was 16 min, representing an average speed of 560 m.p.h.

Examination of the Meteor 7 disclosed various innovations, notably the fitting of retraction gear for the gyro gunsight and the rearrangement of the front instrument panel to accommodate the sight when stowed. Retraction is normally effected by means of a switch to the left of the sight, but for emergency use there is a red-painted, instantly accessible knob. With the sight lowered the field of view is decidedly improved—important in fighting and training alike.

H. F. K.

NORTH PACIFIC NAVIGATION

—IN A LIGHT AIRCRAFT : LESSONS OF A LONG-DISTANCE FLIGHT

By Michael Townsend, R.A.F.V.R.

THERE are four main factors to be considered in any flight—aircraft performance, meteorology, navigation technique and topography. As the first falls off, the three latter become increasingly important. The topographical factor is just as important on short flights as it is on long ones and is, I think, well appreciated by the average private flier who map-reads his way over the countryside. The study of navigation and meteorology, however, has been too often considered the province of the four-engined man. If long-distance private flying develops, as it is likely to do once petrol and currency restrictions are over, it will be the man with an understanding of the synoptic chart and the bubble sextant who will live the longest.

Francis Chichester, in his remarkable flight from New Zealand to Australia via the Norfolk and Lord Howé Islands, proved that accurate navigation in a light aircraft was possible. Other famous flights, like Lindbergh's Atlantic crossing and Pangborn's Japan-America flight, showed that small machines could survive the more severe flying conditions of higher latitudes. The importance of the navigational factor was reduced in these flights, however, by the existence of a continent as landfall at either end. More recently, two American Piper Cub Super Cruisers made a complete flight round the world in formation. This was assisted by the carriage of an abnormal amount of radio equipment for light aircraft and by a military escort over that part of the route which offered the principal navigational and meteorological problems. No single one of these flights really included to the full the dual tests of accurate navigation and of all-weather flying.

An opportunity to make such a flight occurred in April, 1948, when I agreed to navigate Mrs. Richarda Morrow-Tait round the world in a Percival Proctor. Apart from extra petrol tanks, only the normal equipment was to be carried. The route chosen covered, as nearly as possible, every type of flying weather in the world, from the perfect conditions of the Mediterranean in summer to the severe climate of the Aleutian Islands.

The pilot had less flying experience than the average club flier and, as she financed the flight entirely herself, it was very much a private pilot's enterprise. The estimated cost of expenses *en route*, including fuel and oil, was £500 and, in spite of delays in France and India, less than two-thirds of this sum had been used for two-thirds of the flight. The extra expenses in India were offset by the generosity of the United States Air Force in the Pacific area.

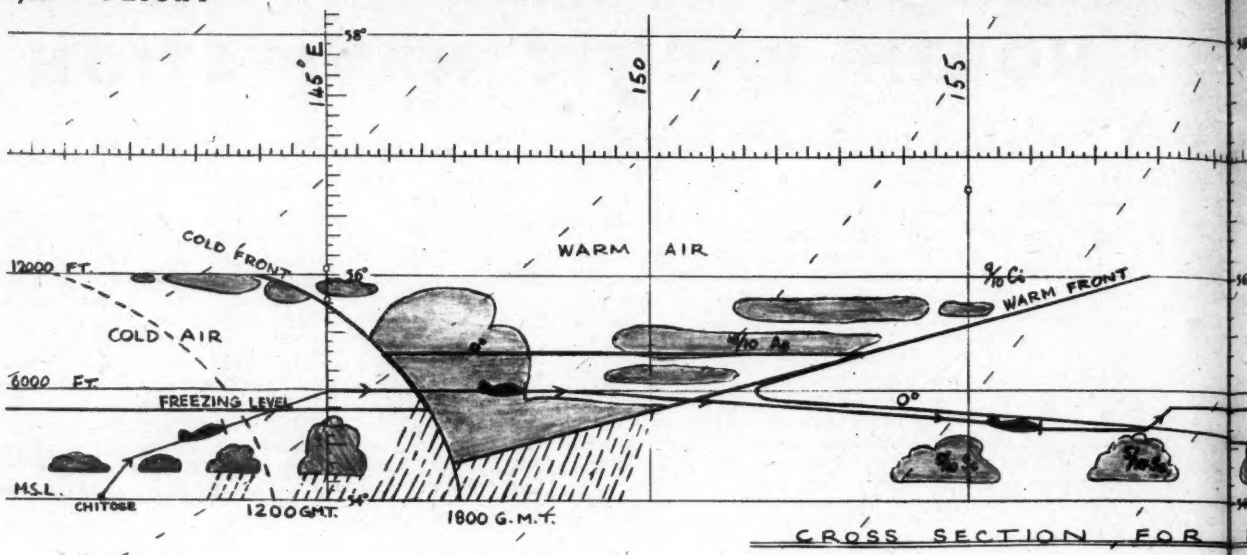
The Proctor, "Thursday's Child," in which the flight was made. In the background are the mountains of the Alaskan Range.

IN presenting this record of a long-distance ocean crossing in a light aircraft, "Flight" is not concerned with the merits or demerits of making such journeys. The author, who was navigator to Mrs. R. Morrow-Tait on her recent attempt to fly round the world in a Proctor, had clearly made a close study of the factors involved in trans-ocean flying, and this account of the Japan-Alaska crossing of the North Pacific via the Aleutians Chain teaches some lessons which should be of value to all who have to fly in areas where extremes of weather may be encountered. It also, incidentally, reveals an unusual display of endurance and courage by a comparatively inexperienced pilot. Mr. Townsend, who has been reading geography at Cambridge, last week graduated as B.A.

The part of the route less familiar to most of us in England, and that which offers the greatest meteorological and navigational problems, is the North Pacific area. It is dominated by the Asiatic monsoon and the Aleutian depressions and the feasibility of crossing it in a light aircraft depends entirely on the vagaries of these two factors. In the summer the Aleutians are usually fog-bound and in the winter the Siberian anticyclone gives headwinds on the over-water section of the route (Hokkaido-Shemya). The fog can be defeated by G.C.A., leaving a summer flight as the obvious choice, unless the aircraft has a still-air range of something like 2,300 miles. The whole flight round the world was planned, therefore, to enable the Pacific crossing to be made in August or early September. The Alaskan section of the flight would be reached before temperatures fell appreciably, but it would mean flying through the height of the south-west monsoon in India when it was at its height.

Navigational techniques were limited by the lack of specialized

[*Continued on page 768, after chart of flight.*]


145° E
150
155
58°
56°
54°
COLD FRONT
WARM AIR
12000 FT.
COLD AIR
6000 FT.
FREEZING LEVEL
M.S.L.
CHITOSE
1200 G.M.T.
1800 G.M.T.
9/10 Ci
WARM FRONT
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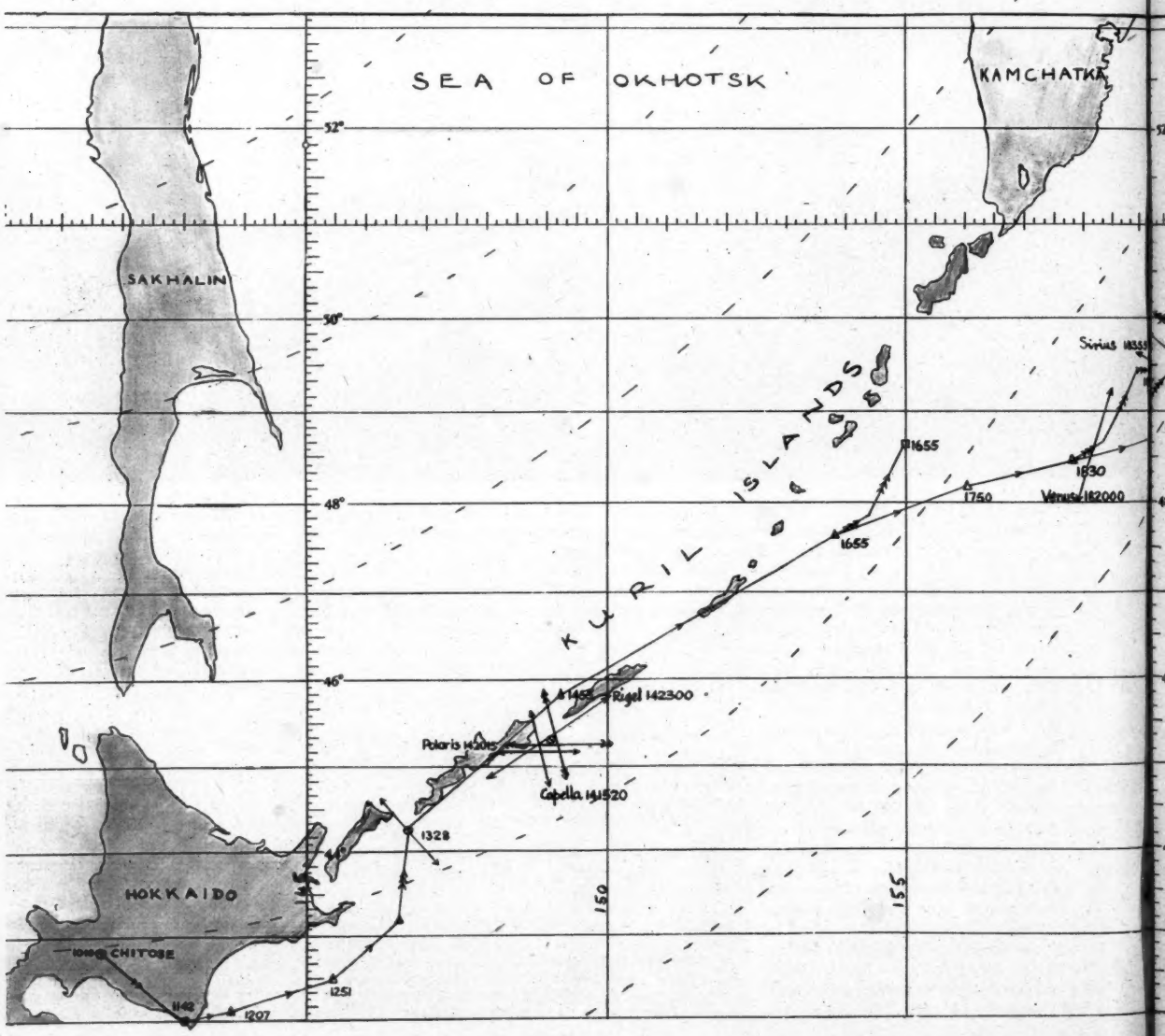
0°
CROSS SECTION FOR


SEA OF OKHOTSK
KAMCHATKA
SAKHALIN
KURIL ISLANDS
HOKKAIDO
52°
50°
48°
46°
44°
Sirius 1835
1655
1830
1750
Venus 182000
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Rigel 142300
Polaris 142015
Capella 131520
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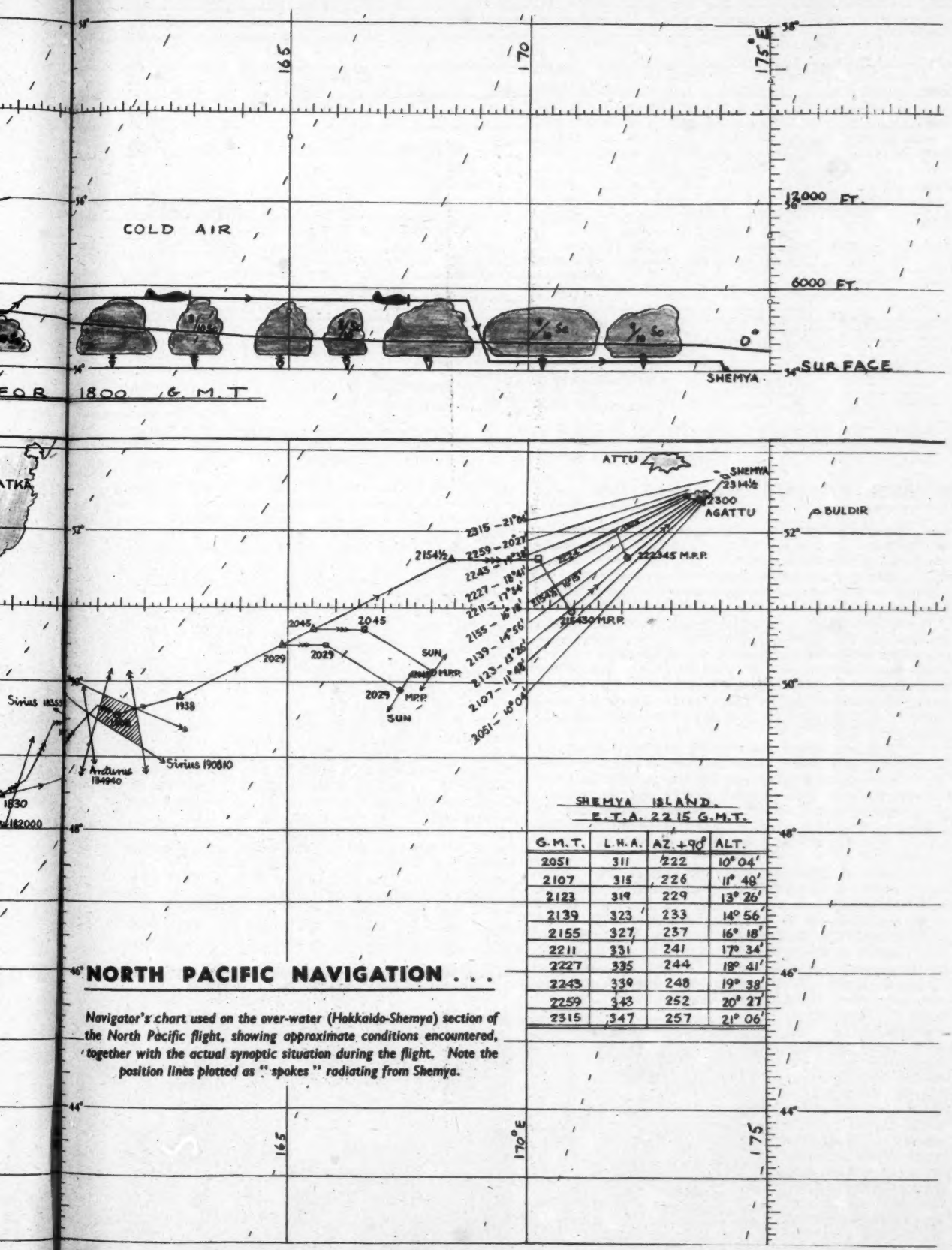
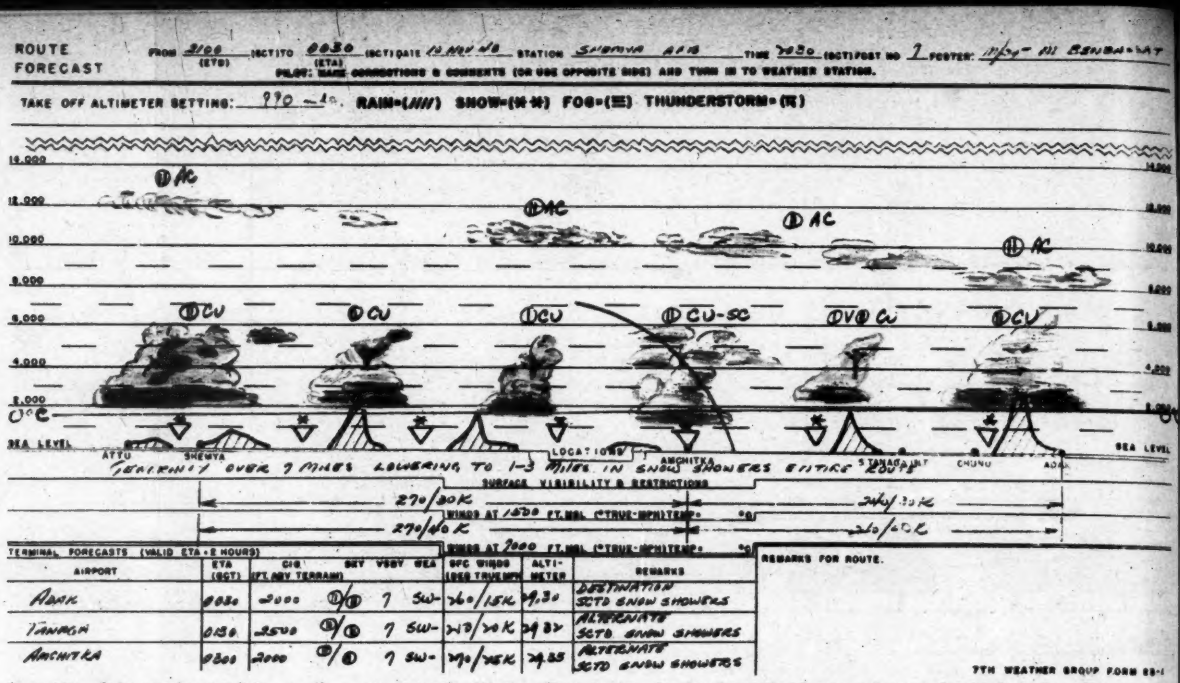


SHEMYA ISLAND.
E.T.A. 2215 G.M.T.

G.M.T.	L.H.A.	AZ. +90°	ALT.
2051	311	222	10° 04'
2107	315	226	11° 48'
2123	319	229	13° 26'
2139	323	233	14° 56'
2155	327	237	16° 18'
2211	331	241	17° 34'
2227	335	244	18° 41'
2243	339	248	19° 38'
2259	343	252	20° 27'
2315	347	257	21° 06'

NORTH PACIFIC NAVIGATION . . .

Navigator's chart used on the over-water (Hokkaido-Shemya) section of the North Pacific flight, showing approximate conditions encountered, together with the actual synoptic situation during the flight. Note the position lines plotted as " spokes " radiating from Shemya.



Some idea of the weather conditions on the section over the Aleutian Chain is given by this facsimile of a route forecast for the flight from Shemya to Adak (400 nautical miles). The top of a weak ridge between these two points was forecast to give "light" winds of 25-30 kt. The forecast proved accurate, and the flight was made at low altitude under V.F.R. conditions.

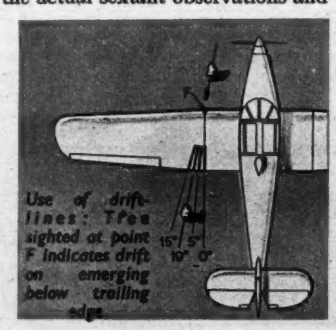
NORTH PACIFIC NAVIGATION . . .

navigating equipment carried in the average light aircraft. Furthermore, the cost of any equipment had to be within the range of the ordinary private flier's pocket. Besides the Standard P.8 compass and blind-flying panel, a Mk IXa sextant, an astro-compass and a plotting-board formed the navigation equipment.

It was found very difficult to fit a drift recorder to the Proctor and drift-lines radiating from a focal point were painted on each wing, as shown in the sketch below. Drifts could not, unfortunately, be taken over the sea. The bubble sextant and a Murphy single-channel LA/12/V.H.F. radio, with interchangeable T/Rs operating on 116.1 Mc/s and 126.18 Mc/s, were the mainstay of over-water navigation.

Over land, navigation would be by map-reading, supplemented by drift observations and course-checks by the sun. On over-water flights reliance was to be almost one hundred per cent upon celestial observations, and an air-plot, until the last thirty miles. Homing would then be assisted by Q.D.M.s or G.C.A. (116.1 Mc/s is G.C.A. frequency and 126.18 the tower frequency for the North Pacific area).

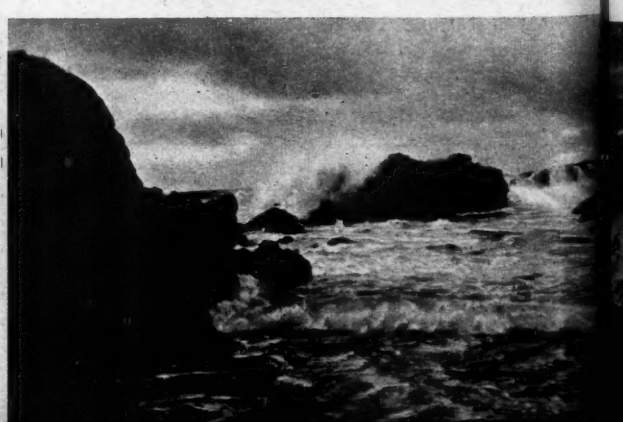
No system of light-aircraft navigation is complete, however, without a method of celestial homing to fall back on in case of radio failure. A worthwhile homing, celestial or otherwise, should give rapidly, and at will, the track to fly to reach the destination at any time during the last forty minutes of the flight. Such a method was developed for the purpose of finding Shemya Island at the end of the 1,730-mile Pacific crossing. No work was necessary in flight other than taking the actual sextant observations and doing a little simple interpolation on the chart. All necessary calculations were done on the ground before take-off, which was so planned that the sun would be abeam of the aircraft at E.T.A. The position-line obtained by a sun observation during the last hour of the flight would then be approximately parallel to track. Before take-off, the altitude and azimuth of the sun at Shemya Island were calculated at convenient intervals for one hour either side of E.T.A. The resultant position-lines were then plotted as "spokes" round the island and named with their time and altitude. Space does not permit a full explanation of the system, but an idea of its operation can be obtained by examining the chart (pp. 766-767) used on the Pacific flight.



Use of drift-lines: Tree sighted at point F indicates drift on emerging below trailing edge.

At 21 hr 54 min 30 sec G.M.T. the sun's corrected altitude was observed to be 16° 36′. A glance at the chart enabled the island position line (the "spoke") for 21 54 30 and its appropriate altitude to be interpolated and marked in thus: "21 54 30—16° 15′." Since the observed altitude was 16° 36′, the aircraft must have been 21 n.m. nearer the sun than was that line. The Most Probable Position for 21 54 30 was therefore obtained by laying off 21 n.m. southwards at right-angles to the line (21 54 30—16° 15′) from its nearest point to the D.R. position. The track to Shemya Island was then given by the "spoke" on which the M.P.P. lay and an alteration of 28° to port was given. Cloud obscured the sun until 22 hr 23 min 45 sec, when another observation was taken, H_o being 18° 50′. The plotting procedure was repeated as before and this time the M.P.P. lay right on the same spoke, indicating that the aircraft was maintaining the correct track. The sun was again obscured until landfall was made on track at 22 hr 55 min. Had the sun been visible all the time, observations would have been taken at the exact time of each precomputed spoke and interpolation would have been unnecessary. There are two limitations to this homing system:—

No place for an off-shore ditching: typical coastline (and weather) of Shemya, one of the Aleutian Islands.



(1) It cannot be used for high altitudes of the sun, due to the difference in azimuth at the island and the D.R. position.
(2) A very large error in E.T.A., if uncorrected before the homing is started, can give a moderate error in the track for home. In the flight to Shemya, for example, an error in the D.R. position of 30 n.m. in an E.-W. direction, if uncorrected before the last half-hour, can give a 5° error in the homing.

The timing of the flight went astray by eight weeks, due to the necessity for an engine top-overhaul and a repair to the starboard undercarriage leg at Calcutta. Hokkaido was not reached until October 29th, so that the Siberian anti-cyclone was building up and unfavourable winds were setting in over the Pacific. The following conditions were necessary for making a safe flight:—

(1) A 20-knot-average tail component, to give a flight time of 12 hours (2 hours reserve).
(2) Cloud tops must be below 7,000 feet and/or cloud must not be consistently 10/10, so that celestial observations could be taken and a final descent to Shemya made without getting iced up.
(3) No severe icing conditions to fly through.
(4) Good terminal forecast for Shemya.

Condition (1) could be satisfied by a "low" moving north-eastwards over Kamchatka; it must not be close enough, however, to affect either terminal or give severe frontal conditions on the route. Condition (2) was given occasionally by the passage of a "high" cell eastwards, immediately to the south of track. Landing conditions in the Aleutians were almost unpredictable, but might be good if a ridge was passing over at the desired landing time.

Waiting for the Weather

Having told the Tokyo weather office what we wanted, we departed to Chitose, our jumping-off point, where we swung the compass and waited hopefully. Tokyo signalled through route forecasts every time a flight seemed possible and we accepted the third (the first two being rejected due to poor terminal forecasts for Shemya). All our stipulated conditions were fulfilled on November 3rd by an 11 hr 49 min flight-plan, nowhere more than 6/10 cloud *en route*, freezing level 7,000ft at Chitose, decreasing to the surface at Shemya, and a Shemya forecast of 6/10 low cloud, base 2,500ft.

The chart on pages 766-767 shows the approximate conditions encountered, together with the suggested actual synoptic situation during the flight. No blame can really be attached to the Tokyo forecasters, as weather reports from the Siberia and Kamchatka region are few and often garbled and pressure systems can seldom be accurately located in the North-West Pacific. The Kamchatka "low" was probably rather closer to track and the occluded front gave more severe weather than was forecast.

Take-off from the 1,400-yard concrete runway at Chitose was made at night, in pouring rain and with a fuel overload approximating the normal payload of the aircraft. "Carrier" technique was used, i.e., releasing the brakes at high revs., and the pilot held the aircraft down until an I.A.S. of 90 kt was registered. A perfect take-off and climb reflected credit on the pilot, as did the eight hours of cloud-flying which followed. Windshield and carburettor icing were both encountered in patches, but no wing ice. The generator failed in the first hour and with it the radio and eventually all the lights. A flashlight was used for navigation-plotting and a deathly hush characterized the headphones for the last 12¼ hours! The number of sun shots obtainable during the last hour was limited by the fact that we were flying at 500 feet through scattered snow showers and below a 8/10-9/10 layer of strato-cumulus. However, the celestial homing was used and to the crew's mutual relief and the navigator's surprise and joy, the island of Agattu materialized out of a snow shower dead ahead, and Shemya was reached 1½ minutes after E.T.A. (13 hours after leaving Japan).

The next problem was the 1,500-mile Aleutian Chain. Perhaps the best idea of flying weather in this region is given by the following extract from the navigator's log, actually written whilst waiting at Shemya for fair weather:—

> "*Nov. 8th.* Weather here is almost unbelievable: Temperatures are moderate, being now in the region of 30° to 35° F. The outstanding feature of the Western Aleutians is the constant high wind; Attu and Adak frequently have 120 m.p.h. gales and Shemya itself has recently recorded 100 m.p.h. readings. These winds originate in intense depressions which form near the west end of the island chain, between the cold Arctic north-westerly outflow over the Bering Sea and the warmer Pacific air from the south. The Aleutians are approximately on the frontal line in autumn and depressions pass along their whole length in rapid succession. Brief fine periods of from three to twelve hours occur with the passage of the intervening ridges. However, usually only the nose of the ridge reaches the Aleutians and there is little breathing-space between cyclones. Two depressions have followed the ridge which was over the island when we arrived and the wind speed has never dropped for more than a few moments below 40 m.p.h., gusts up to 70 m.p.h. being frequent. To-day a depression is parked almost over this island; this morning pressure was 972 mb and still falling."

According to Forecast

After waiting for seven days for conditions in which a light aircraft could taxi without being blown over, the forecast shown was obtained for the 400 n.m. flight to Adak. The top of a weak ridge, centred between Shemya and Adak, was forecast to give light (25-30 kt!) winds. The flight took place at low level under V.F.R. conditions, dodging snow storms and volcanoes, exactly as shown in the forecast. Reasonable conditions were obtained for the flights from Adak to Cold Bay, and from Cold Bay to Anchorage, by the simple expedient of night-stopping at Adak and Cold Bay whilst the ridge overtook us and got into position for the next day's flight. Conditions rapidly improved towards the mainland of Alaska but the most anxious hour of the whole flight occurred due to the sudden formation of ice-fog over both airfields at Anchorage. Visibility was reported as less than a quarter of a mile and a series of attempts to sneak into Merrill (civil) Field along the fog-free coast of Cook Inlet at 200 feet failed. Meanwhile night came down and fuel was getting short; eventually, after several hair-raising passes at Elmendorf

Typical scenery on the Alaska section—Sheep Mountain Pass as it appeared on November 21st.

Before the start of the flight which forms the subject of this article—the Proctor at Haneda U.S.A.F. Base, Japan.

The Proctor and its crew—Mrs. Morrow-Tait (pilot) and Michael Townsend (navigator).

NORTH PACIFIC NAVIGATION . . .

(Army) Field, during which a water-tower light flashed past above the level of the port wing, we managed to raise G.C.A. Troubles were far from over, though. Three blind let-downs were made, and each time the G.C.A. controller brought us down right over the runway. The first time half the runway lights failed; the second time they *all* failed and we nearly removed the top branches of the forest at the upwind end of the runway; and the last time, due to an over-reading fuel gauge, the engine cut out at 300ft. However, we had plenty of speed and the engine picked up after switching to the last (almost empty) tank, without spoiling the glide-path. A successful landing was then made. Twenty minutes later, needless to say, the fog had cleared!

The Arctic section of the flight presented unforeseen problems, due to the effect on the engine of the extremely low air-temperatures; these would not have been encountered if Alaska had been reached in September as planned. Trouble occurred on the ground at Elmendorf when the aircraft was brought out into the sub-zero temperature after being in a heated hangar all night. Unless the engine was started immediately, moisture condensed in the ignition leads. Also, the Proctor had been refuelled in the cold and when taken into the hangar, much of the petrol siphoned out of the tank air-vents on to the floor.

Route through the Rockies

Local advice at Anchorage favoured the 250-mile route through the Rockies via Sheep Mountain and Mentasta Passes. Here again meteorological considerations were all-important.

A week's delay was caused by the severe terminal conditions at Whitehorse, which had almost continuously low ceilings and snow showers. These were caused by a weather situation quite common in winter in the area: one of the Aleutian depressions had followed a southerly path until arrested in the Gulf of Alaska by the Rockies. Here it was stagnating and gradually filling up over a period of days until the only surface evidence of the frontal system was a weak occlusion lying along the coast. This occlusion oscillated gently to and fro, giving low ceilings and precipitation over all the coastal range and also in the Northway-Snag-Whitehorse region, immediately to the east of the range. Eventually all signs of the old depression over the Gulf would disappear at the surface; in many cases, however, it would persist at the 700 mb level and reform at the surface in the area to the east of the Rockies.

On November 21st, both Sheep Mountain and Mentasta Passes were reported clear and a flight was planned to Whitehorse, Yukon Territory. The following log extract may give an idea of the meteorological and topographical conditions, and also of the effect of the Arctic conditions on the engine—these finally leading to a forced landing near the junction of the Eagle and Alaska Highways.

G.M.T.

1830 Taxi start (altimeter 999.8 mb).
1837 ANCHORAGE S/C SHEEP MT. PASS. Zero cloud.
1908 Level off 6,000ft, map reading to GULKANA (beyond pass).
1950 Passing MATANUSKA GLACIER—mass of longitudinal crevasses where it spreads out towards the foot.
1953 In SHEEP MT. PASS at 5,000ft. Air temp. −23 deg C. Very narrow pass, barely wide enough to turn in. High mountains on either side shut out the sun. Speed low (I.A.S: 85 kt). Probably due to downdraughts, as all engine instruments read normal. Difficult to maintain height.
2040 GULKANA. M/F radio fitted by U.S.A.F. at Elmendorf. V.H.F. was indistinct, possibly due to transmission of the accompanying Beech AT.7, as we had received Elmendorf tower O.K.
2100 Layer of low stratus cloud, tops 3,000ft; lying against MT. SANFORD (16,000ft.) and MT. DRUM.
2105 Engine coughed several times, then picked up O.K. Instruments still read O.K.—no drop in boost or revs., oil temp. and press C.K.
2110 CHRISTOCHINA.
2130 Descend to 1,500ft above ground as MENTASTA PASS is overcast.
2210 Engine coughing occasionally. Instruments read normal, but engine losing power. I.A.S. only 80 kt—almost impossible to climb. Temperature −25 deg C. Flying in "tunnel" over the road—mountainsides and cloud roof. (3,000ft clear space.)

No log was kept after 2210 hr, and 27 minutes later the machine could no longer be kept in the air, due to loss of power and over-rich fuel mixture. Cause of the engine failure is still not definitely known but could have been due to the blocking of the carburettor air-intake by ice crystals.

The End—and a Conclusion

When it became evident that the engine would not hold out much longer, the pilot gave the order to fasten safety belts and directed the aircraft over a straight position of the road. After painfully spluttering our way along for a mile below tree-top level, the engine showed no signs of improvement and Mrs. Morrow-Tait set *Thursday's Child* gently down on the road. Unfortunately, Alaskans line their few precious roads with 5ft posts so that they won't lose them—the roads—under the snow. The posts were not wide enough apart to let us through.

Subsequent camping operations were interrupted by the arrival of an Alaska Highway patrolman—it was just as well, really, as the temperature was about 35 deg. below zero.

The main purpose of this flight was to show that the private flier of limited means could travel independently anywhere in the world. In spite of the use of an old Service aircraft, a successful flight was accomplished in all the most severe types of flying weather, from the monsoon of India to winter weather in the Aleutians. Extreme cold by itself is not generally considered to give severe flying conditions and the ultimate engine failure of the Proctor would probably not have occurred if the aircraft had been "winterized." Aeroncas and Piper Cubs fly every day in such temperatures in Alaska.

It is concluded that successful navigation of a light aircraft depends almost entirely upon a good knowledge of the sextant and a keen appreciation of meteorology. The forecaster can only indicate the weather likely to be encountered; it is the pilot who must decide whether his aircraft can fly through it.

Journey's premature end: "Thursday's Child" after a valiant attempt to put down on a highway in Alaska. Five-foot snow-posts alongside the road brought this result.

Rotor Testing

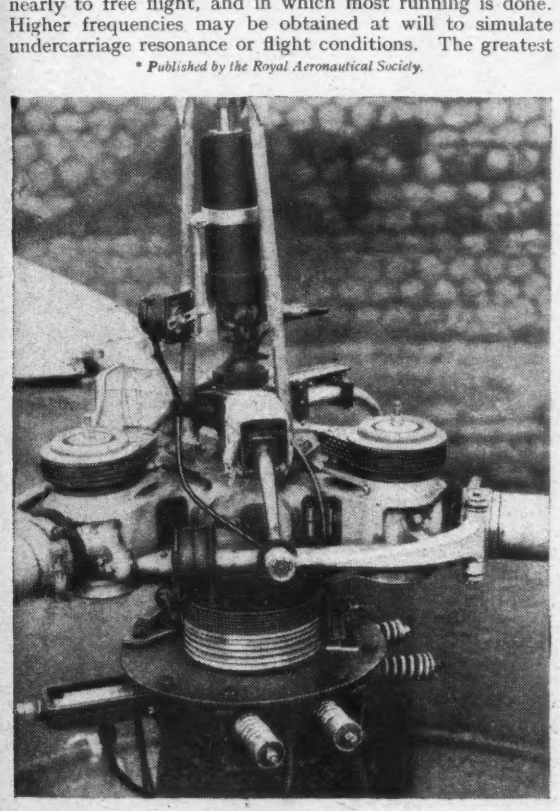
Design and Development of the Bristol Tower

AN admirably concise picture of the helicopter rotor-testing tower at Filton is given in a recent report* by Mr. R. F. Tayler, A.M.I.Mech.E., of the Bristol Aeroplane Company's engineering development laboratory.

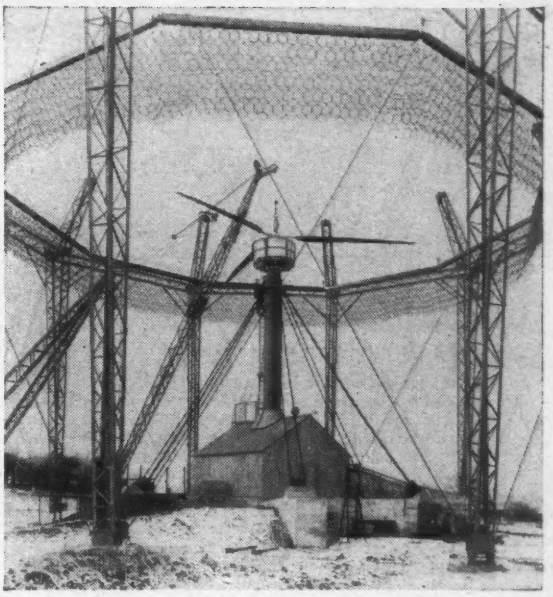
The foundation is a reinforced concrete hexagon platform from which radiate six arms. On this platform is the four-legged pylon structure which straddles the power unit, and at its crown carries the spherical seating in which is supported the base of the tower body. About 3ft in diameter and 25ft high, the latter is a built-up steel tube with transverse diaphragms, the central one of which carries a steady bearing that also supports the weight of the driving shaft.

The tower body is held in the spherical seating by a ring of spring-loaded bolts and is supported by an array of six doubled guy-ropes. The tension in the ropes is adjustable at the anchorages and thus the natural frequency of the system is variable. Vibration in the cables is, however, restricted to the fundamental mode by the restraint of light, stiff frames. The minimum frequency of the tower is about one c.p.s., which approximates most nearly to free flight, and in which most running is done. Higher frequencies may be obtained at will to simulate undercarriage resonance or flight conditions. The greatest amplitude of lateral movement at the hub is about 12in.

* *Published by the Royal Aeronautical Society.*



The Hub: from top to bottom are seen the collective pitch-changing actuator and Desynn transmitter, blade-movement gauges on spider arms, rotor hub, slip-rings and bushes, and out-of-balance gauges and springs.



General view of the tower, showing the suspended steel-mesh safety-net.

The tower cap is an 8ft-high cone rigidly bolted to the top of the tower body and carrying an access and observation platform about 4ft below the rotor. The cone contains the final drive shaft known as the rotor axle. This member is distinct from the main drive shaft which terminates at the top of the tower body, the two being connected by a universal joint which can transmit torque but not end-thrust. When the axle and rotor are stationary, or running under conditions of zero or negative lift, the weight is taken by a ball thrust-race. When, however, the lift exceeds the weight, the upward load is carried by a taper-roller thrust-race. The axle terminates in a detachable serrated mounting ring, so that the mounting of rotors with differing methods of attachment necessitates only a change of mounting ring.

Motive power is supplied by a vertical spindle direct-drive D.C. electric motor, rated at 700 h.p. maximum continuous output, which power can be developed from the maximum speed of 680 r.p.m. down to 180 r.p.m. Over 1,000 h.p. can be developed, however, if required. The motor and pylon structure are enclosed in a steel-framed building.

Safety Measure

For protection in the event of rotor breakage, a ring of wire-braced pylons surrounds the tower and supports a circular screen of heavy steel netting. The diameter of the net screen is 84ft and the whole structure is designed to absorb the greatest amount of energy likely to be stored in a rotor blade which has left the hub at a high rotational speed. The height of the netting is adjustable by means of hand winches on the pylons. As the driving motor is compound-wound, there is no danger of an uncontrolled speed increase in the event of sudden removal of the load.

At the present time, lift measurement is made through strain-gauge units embodied at the base of the rotor axle, immediately above the universal joint to the main drive shaft. It is, however, proposed to instal, in parallel with the present arrangement, a pressure-sensitive hydraulic-capsule system. Speed indication is given by a large moving-coil instrument energized by a small generator driven directly by the main motor. Power absorption is found by measuring the electrical power input and referring to the efficiency curves for the motor for various speeds and armature voltages.

Gear to record out-of-balance forces is incorporated at

(*Concluded at foot of p. 775*)

"NATIONAL" NEWS

Elmdon Nominations: Six Jets: R. Aux. A.F. Race

BY the end of last week, over 110 applications to enter seven contests in the National Air Races (July 31st-August 1st) had been received by the Royal Aero Club. The only disappointing aspect of this fine response is the paucity of foreign entries: so far there are three nominations from Czechoslovakia, for a Sokol M.1.C, a Hodek H.K.101 and an Aero 45, two from France (for Nord 1203s) and one for a Swedish Safir. No applications had come from America by the time entries closed finally (at double fees) last Monday.

Undoubtedly, the most spectacular aspect of the Races will be the appearance of jets in an event specially staged for them, the S.B.A.C. Challenge Trophy contest, and it is now learned that this type will take part in an additional event, for R. Aux. A.F. squadrons, to be flown on the Sunday. It will actually be the first occasion on which Meteors and Vampires will be matched, for the S.B.A.C. Trophy is to be contested on the Monday.

In the latter event are competing a Hawker P.1040, a P.1052 (raked wing), de Havilland Vampire 3 (with Mk. 4 Goblin) and D.H. 108, Gloster Meteor 7 and the Vickers-Armstrongs Swift; this last-named type is actually the Supermarine 510, the entry list disclosing a manufacturer's type-name not yet announced as being approved by the Ministry of Supply.

In connection with this event an interesting situation has arisen, for the maximum speeds of the majority of the types have not yet been made public, and the ban will be maintained throughout the practising and racing period, only one handicapper being let into the secret in the case of the most advanced types. Racing speeds will be announced after the event, but the figures will, in effect, disclose very little, for the Elmdon course (to be lapped four times in this event) is a quadrilateral with each leg averaging only five miles in length; such fast aircraft are bound to swing very wide at the turning points, and this fact will make estimation almost impossible.

Two Amphibians

The application list is notable for the reappearance of a number of smaller aircraft of pre-war vintage seldom heard of to-day. Two amphibians—a Short Sealand and a Goodyear Duck—are among the entries.

Some details of the individual events (number of laps, etc.) appeared in *Flight* of May 26th, and in the issue of June 16th we published a sketch-map of the course. A complete guide to the meeting will appear in *Flight* of July 28th.

Nominations announced by the R.Ae.C. are as follows (where the pilot is unspecified, we indicate the name of the entrant:—

King's Cup (July 30th).—W. H. Moss (entrant) (Mosscraft), E. J. Morton (Messenger), L. W. Hamp (Messenger), W. P. Bowles (Messenger), P. G. Lawrence (Messenger), A. L. Cole (Comper Swift), W. P. I. Fillingham (Chipmunk), W. H. Moss (entrant) (Mosscraft), T. Rose (Gemini), W/C. M. A. Smith (Gemini), A. Cdre. J. Oliver (Gemini), F. Dunkerley (Gemini), J. C. Turnhill (Mentor), H. T. Ryan (Hawk III), A. McDowall (Hawk Trainer), J. B. Thompson (Hawk Trainer), D. C. Jemmett (Hawk Trainer), J. Findlay (Hawk Trainer), C. A. N. Bishop (Hawk Trainer), J. C. Milli (Magister), S/L. J. Rush (Falcon), J. G. Wallers (Nighthawk), J. N. Somers (Gemini), J. G. Crammond (Parnall Heck IIIc), W/C. D. B. Bennett (Proctor I), C. F. Hughesdon (Proctor I), D. J. Jemmett (Proctor I), W. I. Lashbrook (Proctor III), W. Stuart (Proctor IV), H. A. Purvis (Proctor V), A. J. Bradshaw (Proctor V), Miss R. M. Sharpe (Miles Mercury IV), C. G. Alington (Sparrowhawk), R. R. Paine (Hawk Speed Six), Rear-Admiral M. S. Slattery (entrant) (Sealand), W/C. J. Armour (Master II), J. Fosset (Dove I).

The King's Cup.

S.B.A.C. Trophy (jets).

Kemsley Challenge Trophy (July 30th).—G/C. A. H. Wheeler (Spitfire 5b), J. W. Morgan (Spitfire Trainer), P. G. Lawrence (Firebrand 5a), Rear-Admiral M. S. Slattery (entrant) (Sturgeon), R. W. Jamieson (Hornet 20), F. Murphy (Sea Fury Trainer), J. Cunningham (Vampire 3), Neville Duke (Hawker 1040).

Grosvenor Trophy (August 1st).—Lt. J. Blunden, R.N. (Piper Cub), W. M Evans (Tiger Moth), H. K. Hughes (Tiger Moth), G. M. S. Kemp (Tiger Moth), P. G. Lawrence (Blackburn B.2), S/L. H. R. Bilbrough (Chilton D.W.1), G/C. E. L. Mole (Bibi B.E.550), A. Harrison (Auster V), D. McCaskill (Auster V), W. H. Leadbetter (Auster V), L. W. Hamp (Messenger), W. P. Bowles (Messenger), E. J. Morton (Messenger), A. Cdre. J. Oliver (Goodyear Duck), D. A. Arch (Auster V), W. P. I. Fillingham (Chipmunk), D. C. Jemmett (Hawk Trainer), C. A. N. Bishop (Hawk Trainer), R. S. Bradley (Globe Swift), S/L. Rush (Falcon), Kovo, Ltd. (entrant) (Sokol M.1.C.), J. Wallers (Nighthawk), S/L. A. R. Moore (Safir), Miss R. Sharpe (Miles M.28), C. G. Alington (Sparrowhawk), R. R. Paine (Hawk Speed Six), Kovo, Ltd. (entrant) (Hodek H.K. 101), S/L. A. R. Moore (Saab Safir).

Air League Challenge Trophy (August 1st).—A. E. Gunn (Balliol T.2), G/C. A. H. Wheeler (Spitfire 5b), P. G. Lawrence (Firebrand 5a), Rear-Admiral M. S. Slattery (entrant) (Sturgeon), G. H. Pike (Hornet 20), E. S. Morrell (Sea Fury Trainer).

Norton Griffiths Challenge Trophy (August 1st).—J. Mollison (General Aircraft Cygnet III), P. G. Lawrence (Messenger III), E. J. Morton (Messenger IVA), A. Cdre. J. Oliver (Gemini), T. Rose (Gemini), J. G. Wallers (Nighthawk), W. Stuart (Proctor III), H. A. Purvis (Proctor V), A. J. Bradshaw (Proctor V), J. N. Somers (Gemini), Kovo, Ltd. (entrant) (Aero 45), P. Gallay (Nord 1203), F. Duperré (Nord 1203).

S.B.A.C. Challenge Trophy (August 1st).—J. Cunningham (Vampire 3), R. Dryland (Meteor 7), Neville Duke (Hawker P.1040), T. S. Wade (Hawker P.1052), John Derry (D.H.108), M. Lithgow (Vickers-Armstrongs Swift).

Siddeley Challenge Trophy (August 1st).—London Aeroplane Club (Martin Sharp, Tiger Moth), Cardiff (———, Tiger Moth), Midland (R. L. Jackson, Auster V.J.1), Yorkshire (pilot and aircraft unstated), Bristol and Wessex (———, Autocrat), Newcastle (P. W. E. Heppel, Autocrat), United Services (J. N. Somers, Hornet Moth), Coventry (E. J. Morton, Messenger), Lancashire (F. Dunkerly, Gemini), Redhill (E. Ross, Hawk Trainer), Derby (G. Watson, Hawk Trainer), West London (Miss E. L. Curtis, Proctor), Hereford (C. Alington, Sparrowhawk), Wolverhampton (D. Jemmett, Hawk Trainer).

Left, Grosvenor Trophy (light aircraft, international) and Air League Cup (over 250 m.p.h. piston-engined aircraft, international); right, Norton Griffiths Trophy (aircraft of 2,205-3,858 lb a.u.w., international).

(3) Historic photographs and caricatures from "Flight" were on view.

PARTY PIECE

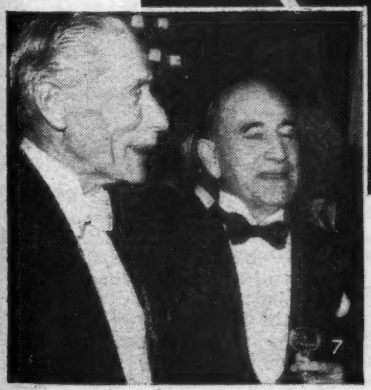
Some Notabilities at the Handley Page 40th Anniversary Celebration

As described last week, some 400 of the leading figures in aviation and its associated industries assembled in London on June 17th to honour Handley Page, Ltd., on the 40th anniversary of the company's incorporation. Here is a record by "Flight's" photographer.

(1) Lord Strabolgi and Sir Richard Fairey. (2) Sir Frederick Handley Page welcomes Mr. E. C. Gordon England.

(4) G/C. W. N. Cumming and Mr. Oswald Short.

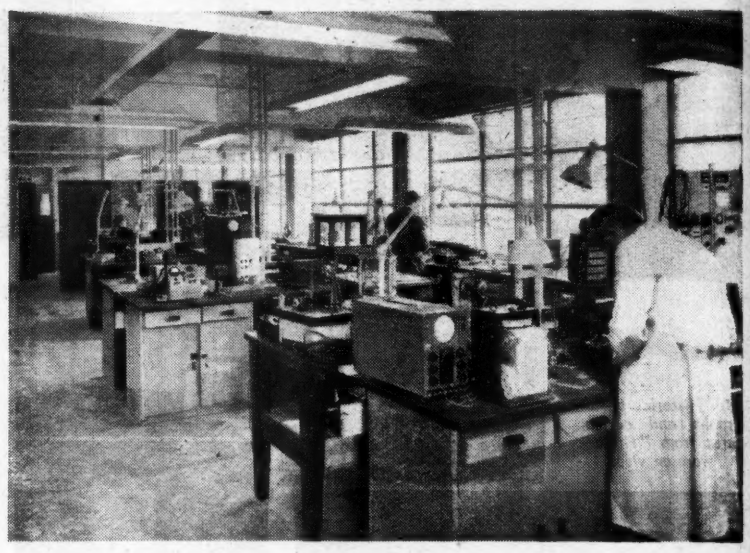
(5) Air Chief Marshal Sir Arthur Longmore. (6) Lord Iliffe and Lord McGowan.



(7) Marshal of the R.A.F. Sir John Salmond and Mr. Fred Sigrist. (8) Capt. J. ("Mutt") Summers with Air Commodore Sir Frank Whittle. (9) Sir A. H. Roy Fedden, Lord Sempill and Rear-Admiral M. S. Slattery.

RESEARCH ENTERPRISE

—public and Private: New Home for R.A.E. Instrument Department : Developments at G.E.C. Laboratories



The R.A.E. gyro laboratory is typical of the new building opened at Farnborough.

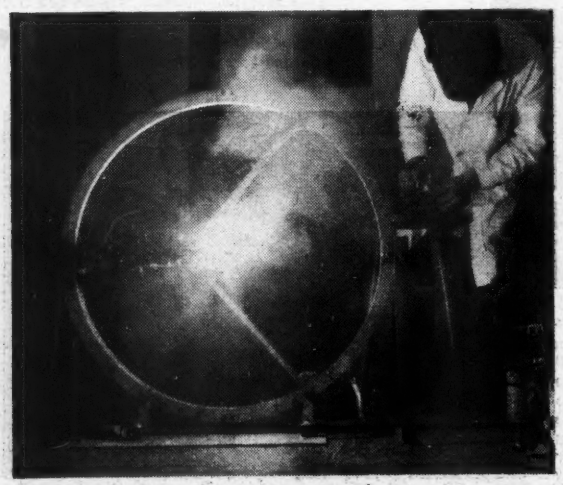
ALTHOUGH the Instrument Department is one of the oldest at the Royal Aircraft Establishment—in 1919 it was known as H Department—it is now housed in the most modern of the buildings at Farnborough. The official opening ceremony was performed last Thursday by the Right Hon. A. V. Alexander, C.H., M.P., Minister of Defence, before a most distinguished company.

In his introductory speech, Mr. W. G. A. Perring, Director of the Establishment, recalled some of the outstanding contributions to aeronautical development which had been made by the Instrument Department; they formed a long list from which it is invidious to select items for mention. Nevertheless, as typifying the degree of importance, reference can be made to the development of the bubble sextant in 1919, and the first flight of an aircraft with an autopilot in 1920. The Larynx pilotless aircraft (equivalent of the German V-1) was developed in 1925, and the following year Dr. Griffith published his now-famous report on the aerodynamics of the gas turbine engine. The radio-controlled Fairie (*sic*) Queen and Queen Bee target aircraft were initiated in the Department, as was the famous "George" automatic pilot. In 1932, the D.R. compass was developed; 1935 saw the introduction of the Mk. 8 bubble sextant and, during the war, the stabilized automatic bombsight was developed. Among navigation equipment, it is sufficient to mention the A.M.U., A.P.I., G.P.I. and drift recorder.

The new building housing the laboratories, workshops and offices of the Department is an architecturally satisfying fabric of "H" plan-form to provide maximum light-area. The central power house supplies A.C. at 400 and 1,600 c.p.s., D.C. at voltages up to 30, and suction at 3½in Hg (with no-flow vacuum equivalent to a height of 50,000ft). Within the laboratories themselves, excellent provision has been made for work benches, lighting and, apart from the special services from the power house, mains electrical supply at 440 and 220 volts A.C., and 210 volts D.C., whilst high-pressure air at 60 lb/sq in, gas and water are also available.

With windows along the north, east and west sides, and roof lights along the centre, the drawing office can accommodate 30 draughting tables. In the model shop the work benches are ranked on each side of a central aisle, whilst along the side walls are some excellent machine tools.

Mr. H. C. Pritchard, the present head of the Instrument and Photographic Department, expressed the aim as being to permit aircraft to operate with maximum safety and efficiency. The problems of control and landing in poor visibility were, he said, still largely unsolved and were, of course, aggravated by jet types, the operational flexibility of which, in this regard, was somewhat limited. Jet aircraft had also brought new difficulties to the instrument man in that the limit of human performance was being reached, chiefly in terms of speed of response, and this emphasized the demand for greater automaticity. In navigation, increases in aircraft speed, range and height brought additional problems, not least of which was study of the upper air conditions. The need for first-class accommodation and facilities for the furtherance of the Department's work had been recognized, and the new laboratories were the result.



Spectacular demonstration of the Helmore light.

G.E.C. PROGRESS

ALTHOUGH enormous organizations and financial resources devoted to research are not uncommon in the United States, there can be very few undertakings of comparable magnitude in Great Britain. Among the few that do exist, however, that of the General Electric Company must assuredly be included.

Under the leadership of the late Sir Clifford Paterson, O.B.E., D.Sc., F.R.S., the research department was started in 1919; today, the laboratories—at Wembley, Middlesex—cover a floor space of approximately 200,000 sq ft, and employ a staff of 1,372, including 36 leading

Research Enterprise . . . .

scientific and 250 scientific members. Despite this, however, demands on laboratory space exceed that available in the parent building by approximately half as much again. The Company's annual expenditure on research is no less than £1,000,000, and approximately one-third of the work done at the laboratories is under Government contract, from which no financial profit is derived.

Naturally enough, research in connection with aeronautical engineering occupies a relatively small fraction of laboratory activity, but when we visited the laboratories on June 22nd, the first items we inspected were the special lights developed for the line-and-bar (Calvert) approach lighting system devised at Farnborough and now installed at London Airport (*Flight*, April 29th, 1948). Also shown were the boundary lights designed for semi-submersion in the runway surface, involving a design problem complicated by the requirements of close beam tolerance, water-tightness and the ability to support large modern aircraft.

Powder metallurgy is a constant subject of research at the laboratories, and it has been found that alloys developed for use in gas turbines can be given better mechanical properties through powdering and sintering than are possessed by the same materials in the equivalent cast or wrought form.

An aeronautically valuable result of G.E.C. research is the Company's heavy alloy—also a powder metallurgy product Heavy alloy is as strong as steel, yet twice as heavy; it contains about 90 per cent tungsten alloyed with nickel and copper and is manufactured by sintering pressed compacts of the mixed metal powders at about 1,450 deg C. Unlike pure tungsten, it can readily be machined; it is also stated to be completely resistant to atmospheric corrosion and salt-water attack, although it may, if required, be plated with any of the usual finishes. To the aeronautical designer, heavy alloy is of chief interest as a means of providing necessary balancing moments in small volumes. The development of a material possessing a tensile strength of over 40 tons/sq in, and a specific gravity of over 16, opens up many possibilities.

By no means the least interesting thing to be seen at the laboratories was the Helmore light, known during the war by the code-name *Turbinlite*. It was developed during the early days of radar, when night fighters could find an enemy aircraft to the extent of knowing that it was somewhere within a 16-deg vertex cone, but could not pin-point it more closely than that. It was therefore suggested that if the night fighter were equipped with a sufficiently powerful searchlight to illuminate the "cone," the enemy aircraft could more readily be destroyed.

G.E.C. were approached and undertook the development of a lamp to meet the requirements. In its final form it threw a light of 50-million candlepower in a 16-deg cone and required 1,200 amperes, 135 kW (the normal searchlight takes 150 amps, 11 kW). Astonishingly enough this was obtained from the normal-type aircraft batteries; the duration was limited to two minutes.

Theseus Lincolns Log 600 Hours

TRANSPORT Command and the Bristol Aeroplane Company have every cause for satisfaction over the behaviour of Theseus turboprops in two converted Avro Lincolns which have now completed more than 600 hours of flying. It will be recalled that the Theseus-Lincoln has only two of the turboprop units, the outboard Merlin piston-engines having been retained because no suitable gear box for the Theseus had been designed at the time of installation.

Having "been through Boscombe" and subjected to thorough handling tests, the Theseus-Lincoln is regarded as a normal transport aircraft. The first operational flight with Bomber Command started on May 7th last year. One of the two aircraft took off from Lyneham at 0900 hr, and just before 1500 hr touched-down at Malta. Most of the flight had been made at 10,000ft with the Theseus units running at only 7,200 r.p.m. The average speed was 222 m.p.h. Next morning the journey to Fayid (Egypt) was resumed, and the Lincoln reached its destination in four hours.

The second Theseus-Lincoln went into service in September, 1948. Between them the two machines have made 24 round trips between the United Kingdom and the Middle East and are still in service on this route. So far as the Theseus have been concerned, crews have had little anxiety. On one occasion, however, the port Theseus stopped through a failure in the fuel supply, and the Lincoln, flying at 20,500ft, began to lose height and soon ran into severe icing conditions. Ice formed on the leading edge of the wings, on the spinners and on the forward edges of all the engine cowlings. It also built up on the stoneguard over the Theseus intakes and on the outer circumference, but stopped before it had completely sealed the intake. An opening only 1in wide remained, but the Theseus were able to maintain a speed of 7,000 r.p.m. as the Lincoln descended to lower and warmer levels. Dispersing, none of the ice found its way into the power units in solid pieces, and no damage of any kind was subsequently traced. On a previous test-bed run a Theseus had cleared after icing, without damage.

The turboprop units in the Lincolns have needed less attention than have the piston-engines, and during its first 200 hours of running every new Theseus has required practically no servicing of any kind. Studies are now in hand for increased icing protection, reversible-pitch airscrews and drives for gear boxes and cabin blowers.

Theseus-Lincolns have a normal endurance of ten hours, but as a precaution are fitted with long-range tanks. Later units than those installed in the Bomber Command machines have shown a substantial improvement in fuel consumption.

Rotor Testing

(*Continued from page 771*)

the head of the rotor axle, the upper bearing of which is held by strain-gauge units against two pairs of springs in the same horizontal plane and perpendicular to each other. Each pair of springs is adjusted to produce a permanent tensile load of 1,000 lb in the measuring unit, so that any out-of-balance force (of less than 1,000 lb) causes cyclic reductions and increases in the tensile load. These fluctuations are indicated on two oscilloscopes. From an examination of the film record of the traces, and with knowledge of the position in azimuth of the blades, it is possible to trace an out-of-balance force to any particular blade or blades. So far, however, such forces have always been attributable to incorrect tracking.

Tracking is determined by direct visual reference, a small metal mirror being attached to each blade near the tip, so that it reflects towards an observer on the tower platform. Two of the mirrors are differently coloured by transparent lacquers, whilst the third is left plain. The effect of directing a powerful light beam at the tips during rotation is to produce three variously coloured "streak" reflections in the tip paths, which can thus be easily identified and the relative heights judged

So far, the testing tower has been used for calibration of a brake fan, for rotor endurance testing, flutter research and proof testing, over-speed testing, and the development of tracking methods. Future test work envisaged includes the strain-gauging of blades and the measurement of blade movements. The tower will be used to help in developing the technique for such measurements, as well as for such quantitative testing as can be done at low forward speed equivalents, i.e., wind speed. Endurance testing of hubs and blades, embracing fatigue tests, are scheduled, together with additional research on flutter, and aerodynamic research including an investigation of mean induced velocity and its cyclic variation.

LUTTERWORTH POST FOR MR. D. L. BROWN

A FURTHER recent addition to the staff of Power Jets (Research and Development), Ltd, is that of Mr. D. L. Brown, A.M.Inst.C.E., A.M.I.Mech.E., M.I.Gas.E., A.F.R.Ae.S., who has been appointed principal of the School of Gas Turbine Technology at Lutterworth.

Mr. Brown is known to many through his long association with the former firm of Miles Aircraft, Ltd., where he was personal assistant to the technical director and chief designer. He was closely concerned with the design of the jet-driven M.52 supersonic project.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE "BEAU"
An Affectionate Tribute

I FEEL that the announcement that the Bristol Beaufighter is to be withdrawn from the Royal Air Force cannot be allowed to pass without comment. The "Beau" has been in the Service for nine years and during that time it has been employed on practically every type of job that aircraft in war are designed for—and some for which they are not! I don't think it ever was used as a heavy bomber, but it *was* used as a "troop carrier." Imagine the reactions of the Duty Flight at a Scottish airfield when a Beau of a Coastal Command squadron based in the Shetlands disgorged *nine* "bodies" halfway to their leave destinations!

When the Beau first became operational many stories were current in the Service that this aircraft had many vices. These stories I am sure were started by those who had not yet flown this type, and I am convinced that all those who did operate on the Beau had nothing but praise for this tough and highly versatile aircraft.

A sure sign that an aircraft is efficient in its role is that the enemy heartily dislikes it. I have had conversations with a number of German sailors who job it was to sail and escort Axis convoys along the Frisian Islands: to them the word "Beaufighter" is still anathema.

Felpham, Sussex. D. G. HALL.

DOUBLE-DECKER AIRLINERS
Claim for the "C" Class Empire Flying Boat

YOUR correspondent Mr. Christopher Blackburn (*Flight*, May 5th) is incorrect in stating that the world's first double-decker airliner was the Short Sandringham I of 1946. May I point out that the world-famous Short Empire "C" class flying boats, built to the specifications of Imperial Airways back in 1936, can rightly claim this honour?

Its spacious crew quarters and main cargo compartment (capacity approx. 1,500 kg) were located on the upper deck, so that this type can rightly be claimed as a "double-decker": moreover, this fact was emphasized by Imperial's publicity literature at that time.

Secondly, it is worth recording that the huge German Dornier Do.X flying boat, *built twenty years ago*, can be regarded as a double-decker for the same reason as the Short Empire boat. True, the Do.X was an experimental prototype and was in many ways years ahead of its time. Nevertheless, many of its basic features have been incorporated in later flying boats built during the past twenty years, and foremost amongst these is the two-decks idea for large passenger aircraft.

Prestwick, Ayrshire. DENNIS M. POWELL.

FREE-BALLOONING
A Fascinating Sport: Memories of a 1918 Fight

I WAS extremely interested in Mr. Charles Gardner's excellent account (in *Flight* of June 9th) of his balloon ascent from Chelsea with M. Dollfus, more especially because it vividly recalled memories of a personal experience in 1918, when, as a Naval Cadet, I had the good fortune to be a passenger in a balloon.

During the first world war free-balloon flying was part of the training of kite-balloon crews, and flights were made from Hurlingham, in South-West London, where I enjoyed the experience in a 60,000 cu ft baloon with a Major Vickers as pilot. My own recollections of this flight, which commenced in bad visibility, are chiefly of seeming to be absolutely stationary in thick fog, and in complete silence. During this early part of the flight we were at times able to find our whereabouts by shouting to people on the ground. Later we rose above the clouds into pleasantly contrasting conditions of sunshine and blue sky. As we descended for our landing, I recall that our trail-rope was dragging over hedges and trees, making the basket rock in a rather uncomfortable fashion; once, when it dragged over an empty house, we could see the tiles coming off the roof. After a flight of 1 hr 17 min, we landed in a field near Clifton, in Bedfordshire, some 40 miles from our starting-point, so the upper wind must have been quite a good one; unfortunately, I have no recollection of the altitudes at which we flew.

I trust that, by recalling this experience, I shall not be guilty of a personal "line-shoot": my real purpose is to express the hope that some effort may be made to revive this unique and fascinating pastime. Though trained balloon pilots still young enough to fly again must be almost non-existent, there must still be an enormous fund of practical experience set down in print in the various Service manuals issued at the time. If the Air Ministry could make these available to any enthusiasts willing to come forward, there might be some hope of a ballooning revival. ROBIN GRANT.

Barnet, Herts.

[The sport is indeed a fascinating one, as all who have read such classics as the Rev. J. M. Bacon's *Dominion of the Air*, and his daughter's *Memories of Land and Sky*, will be aware. A difficulty to-day, of course, would be the objectien to having large and unpredictable objects floating about in areas used by heavier-than-air craft—ED.]

DECK LANDING
The American Method "An Ugly Rush"

IT is not my intention to dig too deeply into an old controversy, but may I expand a little on one aspect of the different deck-landing systems discussed in Mr. Roger Gordon's article in *Flight* of June 16th?

Perhaps the main disadvantage of the American system is that the final stage of the approach—from the "cut" to the landing—is nothing more or less than an ugly rush at the deck. On receiving the "cut" the pilot snaps the throttle shut; to prevent an almost immediate stall the stick must be pushed forward and then, after a plunge at the deck, pulled back to cushion the arrival and to bring the aircraft to a three-point landing attitude. Thus at the most critical moment of the whole operation a series of quick and accurate movements must be made by the pilot.

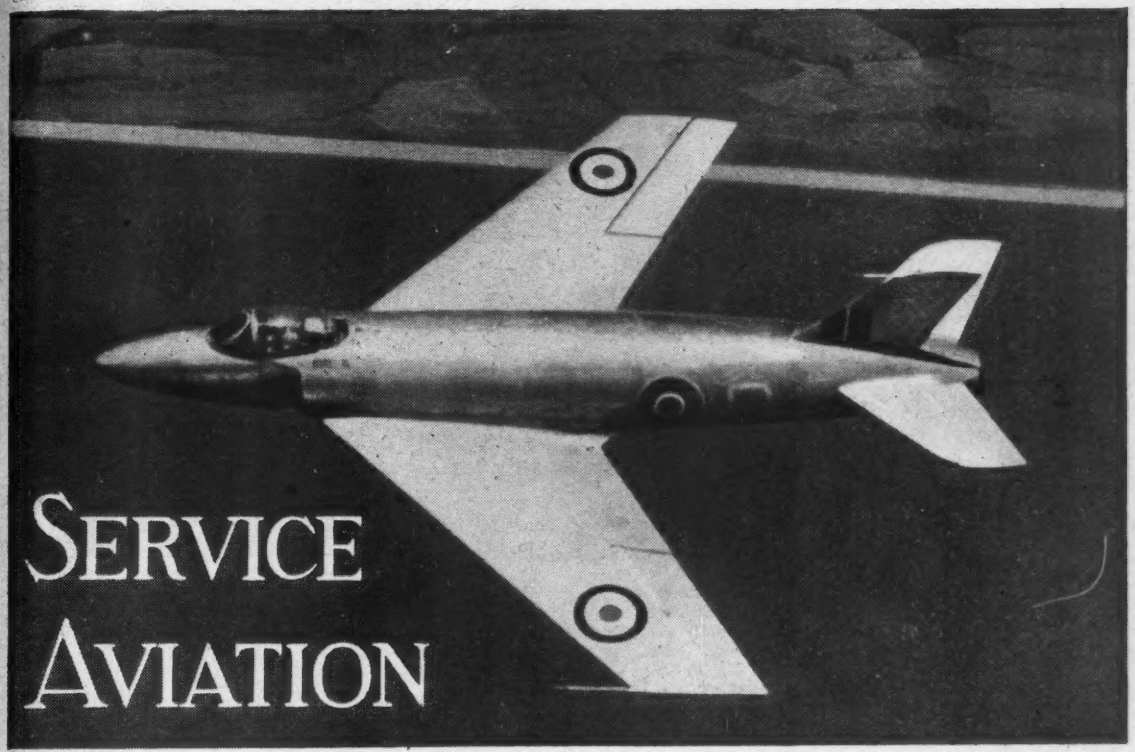
This should not cause the pilot any undue difficulty by day; but, by *night*, when it is difficult to judge height accurately, the system could be dangerous. The old British system scores here in that the aircraft is in the landing attitude during the whole of the approach and can fly right on to the deck, the pilot closing the throttle when he feels the touch-down or receives the "cut" from the batsman. Since accurate judgment of height is not necessary, night landings should be much easier with the British system. I have not landed on a deck for five years, so if in the meantime the American technique has been modified for night landing, please forgive me.

Surely your caption above the McDonnell Phantom picture is not quite correct? It looks to me as if the "cut" has just been given and that a normal landing is about to be made, otherwise the batsman's hands would still be up in the "wave-off" position. EX-832 TYPE.

Peterborough.

FORTHCOMING EVENTS

July 1st.—R.A.F. Golfing Society; Summer Meeting at Moor Park Club, Herts.
July 2nd.—R.N. Air Station, Lossiemouth; "Open Day" and Flying Display.
July 2nd to 4th.—Royal Aero Club; Private Air Rally at Deauville. Guests of M. André.
July 2nd to 10th.—Tour de France Aérien.
July 2nd and 3rd.—Aero Club de l'Orne; Rallye du Point d'Alençon.
July 4th to 11th.—Royal Aero Club; Private Air Rally to Spain.
July 9th.—Royal Naval Air Station, Culham, Oxford; Air Display.
July 9th.—Redhill Flying Club; Garden Party.
July 10th.—Auster Flying Club; Air Display at Rearsby Airfield.
July 16th.—Royal Naval Air Station, Anthorn, Kirkbridge, Carlisle; Navy Day.
July 16th and 17th.—Royal Aero Club; Private Air Rally at La Baule, S. Nazaire. Guests of Mme. André.
July 17th.—Cowes Aero Club; Air Display.
July 20th.—Aircraft Golfing Society: Mid-week Competition, East Brighton.
July 23rd.—"Daily Express" Air Pageant, Gatwick Airport.
July 30th to Aug. 1st.—King's Cup Race and National Air Races, Elmdon Airport, Birmingham.
Aug. 6th.—Southend Flying School: Flying Meeting and Air Display.
Aug. 19th to 26th.—British Gliding Association: National Gliding Contests, Gt. Hucklow, Derbyshire.
Aug. 21st.—Wiltshire Flying Club and Royal Artillery Flying Club: Thruxton Air Races.
Aug. 28th.—Cowes Aero Club: Air Display.
Sept. 6th to 8th.—R.A.F. Golfing Society: Autumn Meeting and Ladies' Section Championship at Walton Heath Golf Club.



SERVICE AVIATION

SWIFT: Michael Lithgow presents the Supermarine 510 (unofficially called Swift) for "Flight's" camera.

Exercise "Verity"

COASTAL, Fighter and Bomber Commands will all be represented in the Western Union naval manœuvres — Exercise *Verity*—which begin on June 30th. In addition to the Lancasters, Sunderlands, Meteors and Lincolns of these three Commands, five Mitchells of the Royal Netherlands Air Force, operating from St. Eval, will take part, and there will also be Fireflies and Sea Furies of the Royal Netherlands Navy at R.N.A.S. Culdrose. The Netherlands Meteors will be fitted with drop-tanks in time for the exercise.

French Maritime Air Force Dornier and Sunderland flying boats, from Brest and Lorient, will be engaged, and Belgian Spitfires are to operate during a preliminary stage of the exercise. Air forces will be under the command of Air Marshal Sir John Baker, A.O.C.-in-C. Coastal Command, who will delegate control to the A.O.C. 19 Group, A.V-M. F. L. Hopps. Headquarters for air operations will be at Plymouth and Brest, where R.A.F. liaison officers will be present. Western Union officers will act as observers throughout the exercise in the Plymouth operations room.

Ships taking part include the Royal Navy fleet carriers *Implacable* and *Victorious*, the light fleet carrier *Theseus*, and the French ship *Arromanches*, of the same class as H.M.S. *Theseus*. The main force will put out from Penzance, after preparatory drills, on July 4th, for three days of mock battles in the Bay of Biscay. It is estimated that, at the height of Exercise *Verity*, some 22,000 men will be at their stations. The overall commander of the forces engaged will be Admiral Sir Rhoderick McGrigor, flying his flag in H.M.S. *Implacable*.

Royal Air Force and Naval Aviation News and Announcements

R.A.F. Appointment

FOLLOWING his recent return from Germany, where, as head of the Air Branch of the British element of the Control Commission, he was largely responsible for organizing the Berlin end of the Air Lift, A. Cdre. R. N. Waite, C.B., C.B.E., has been appointed commandant of the R.A.F. Officers' Advanced Training School and commanding officer of R.A.F. Station, Bircham Newton, Norfolk.

A. Cdre. Waite, whose work in connection with the Air Lift was recognized by his appointment as a C.B. in the King's Birthday Honours, went to Germany shortly before the end of the war to assist in the disarmament and dissolution of the German Air Force, which, as head of the disarmament staff at Supreme Headquarters, he had been planning since early in 1944. He was appointed head of the air branch, Combined Services Division, Control Commission for Germany (British Element) in January, 1947.

His wartime duties were mainly concerned with the anti-submarine campaign, including a period at the H.Q. of 15 (Coastal) Group, and command of the R.A.F. stations at St. Eval, from which anti-submarine patrols were flown, and Nassau, in the Bahamas, where thousands of Coastal Command aircrews were trained. He was commissioned in 1920 from Cranwell; shortly afterwards he became a flying instructor and took a prominent part in pre-war Hendon air displays.

M.T. Competition

WINNING unit in the first of a series of half-yearly mechanical transport efficiency competitions, held in B.A.F.O., Germany, was No. 317 Supply and Transport Column, R.A.F. Utersen, which is commanded by F/L. W. W. Charlton. Points were awarded not only for serviceability, low accident rates, and appearance, but for efficient office work.

R.A.F. Dinner Club Revival

WITH the support of the Chief of Air Staff and the Air Member for Personnel, the R.A.F. Dinner Club, which was formed after the first World War at the suggestion of Lord Trenchard, is to be revived. Membership will be confined to pre-war members of the Club and to serving and retired permanent Wing Commanders and above.

Apart from the pleasure of meeing old friends, the Club's annual dinner gave officers the opportunity of hearing the C.A.S. speak "off the record" on the happenings of the year. Lord Tedder has consented to preside or to ask a member of the Air Council to do so if he is unable to be present. As a first step towards re-establishing the Club, the chairman and secretary have endeavoured to compile a list of members, but records contain only the names of life members and about 70 per cent of pre-war annual members. Eligible officers interested in joining should write to the Honorary Secretary, R.A.F. Dinner

Service Aviation . . . . .

Club, Room 233, Adastral House, Kingsway, London, W.C.2. Fees are £3 3s for life members and 5s for annual members. The date of the next dinner depends on the response, but it is intended to hold it as soon as is practicable.

Auxiliary Appointment

THE Air Ministry announces that S/L. J. B. Wales has been appointed to command No. 613 (City of Manchester) Squadron, R.Aux.A.F. Beginning his Service career as a second lieutenant in the Manchester Regiment, S/L. Wales transferred to the R.A.F., in which he was commissioned in 1940. After training, which included a course at No. 1 School of Army Co-operation, he flew with No. 4 Squadron until he went overseas at the end of the year.

From June, 1942, until May, 1943, he flew from Colombo on Army Co-operation duties. He joined Air Command, South-East Asia in 1944 and returned to England the following year. In March, 1947, he joined 613 Squadron, having been demobilized the previous year, and was awarded the Efficiency Medal in 1948.

R.A.F. Permanent Commissions

THE following officers have been selected for permanent commissions in the Royal Air Force, in the branches shown:

GENERAL DUTIES BRANCH.
Flight Lieutenants: W. J. Hemming, D.F.C., C. B. Houghton, P. D. Menzies, I. L. Scott, D. L. Stevenson, D.F.C.

TECHNICAL BRANCH.
Flight Lieutenants: A. H. Allmond, N. J. Ambrose, R. B. Bryan, A. Ferris, C. H. W. Champness, R. E. Powell.

EQUIPMENT BRANCH.
Flight Lieutenant: J. O'Hara, M.B.E.

SECRETARIAL BRANCH.
Flight Lieutenant: M. P. Casano, M.C.

AIRCRAFT CONTROL BRANCH.
Flight Lieutenant: A. L. McGrath, D.F.C., A.F.C.

PROVOST BRANCH.
Flight Lieutenant: S. Morehem, M.B.E.

PHYSICAL FITNESS BRANCH.
Flight Lieutenant: K. R. Cooper.

"Flight" photograph

GUEST OF HONOUR: While in camp at Thorney Island, No. 600 Squadron, R.Aux.A.F., held a guest night at which they entertained Air Marshal Sir Alan Lees, A.O.C.-in-C. Reserve Command. S/L. D. R. Proudlove, C.O. of the Squadron, is on Sir Alan's right.

Athletics at Uxbridge

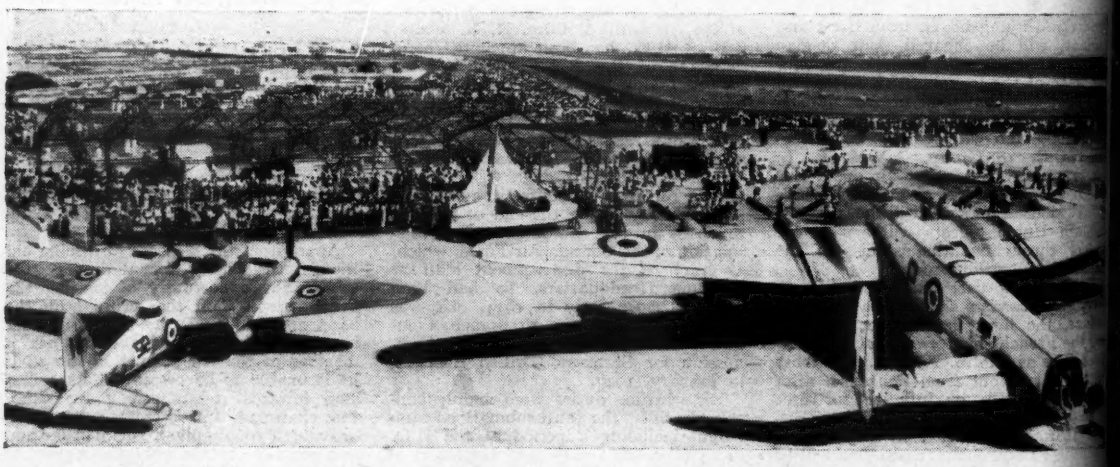
INDIVIDUAL and inter-command athletics championships for the R.A.F. and W.R.A.F. will take place at the R.A.F. Stadium, Uxbridge, on July 7th, 8th and 9th.

Club for Climbers

THE R.A.F. Mountaineering Association is to hold a fortnight's climbing meet near Chamonix, in the French Alps. Members of the French Alpine Club have promised to assist by putting huts at the disposal of the party and helping in route-finding. Led by the chairman of the Association, W/C. A. J. M. Smyth, O.B.E., D.F.C., the party will leave England on July 30th. Membership of the Association, which was formed some 18 months ago, is open to former and serving officers and airmen.

Courses for W.R.A.F. in Germany

QUARTERLY general service training courses, with an intake of 20 to 25 airwomen, are being held for W.R.A.F. members of B.A.F.O., Germany. At the first passing-parade, which took place recently, course members were inspected by A.V-M. J. Seward and G/O. J. L. A. Conan-Doyle, the Air Officer in Charge of Administration and the W.R.A.F. Staff Officer, respectively, of the Command. The courses, which last a fortnight, are primarily designed to improve the administrative knowledge and powers of leadership of junior and potential N.C.O.s. Included in the syllabus are personnel administration and women's marriage law, Air Force law, welfare, equipment, catering, drill, P.T., hygiene, advice on general education, current affairs and talks by a R.A.F. chaplain.



ISLAND ENTERTAINMENT: A scene at Hal Far airfield on June 11th, when the Royal Navy staged Malta's second large post-war air display. Among the aircraft which took part were Seafires and Fireflies from the carriers "Ocean" and "Triumph," R.A.F. Vampires, and the Lancaster and Mosquito target-tower shown above.

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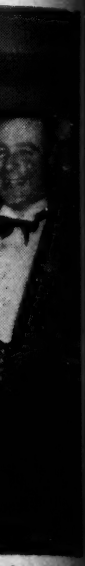

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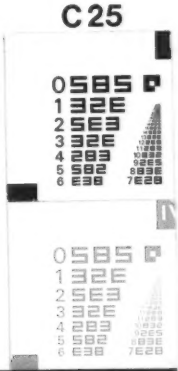
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